THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

Etc.

126532

VOL. LXXXIV.

OCTOBER TO DECEMBER, 1903.

LONDON:

WALTER KING,

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THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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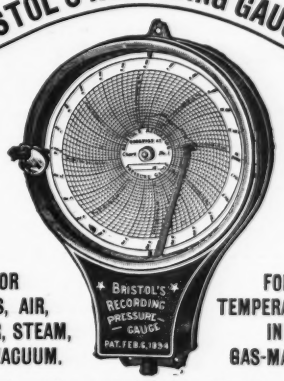

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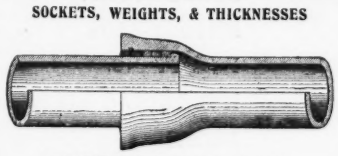

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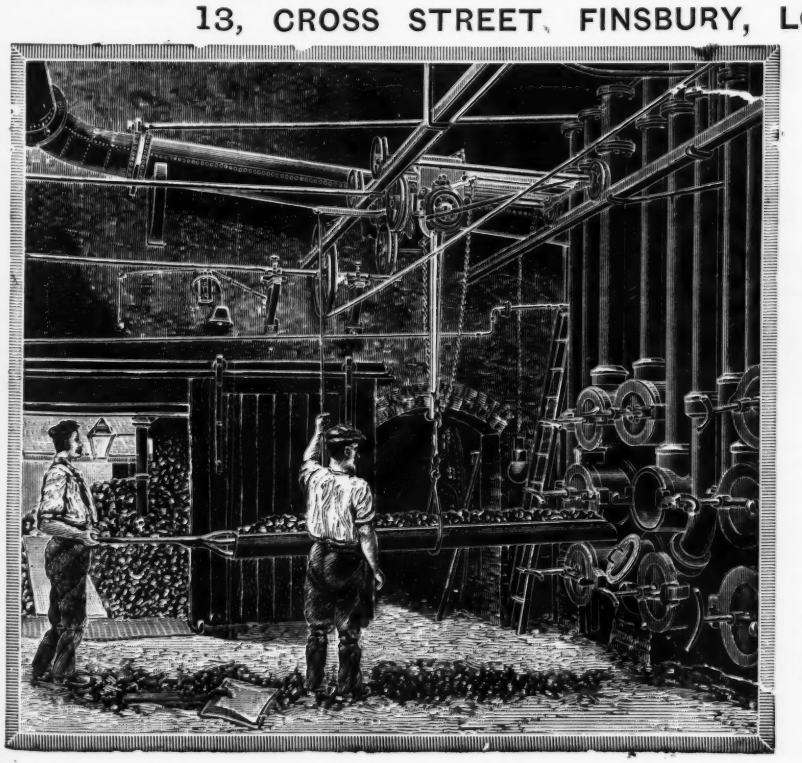

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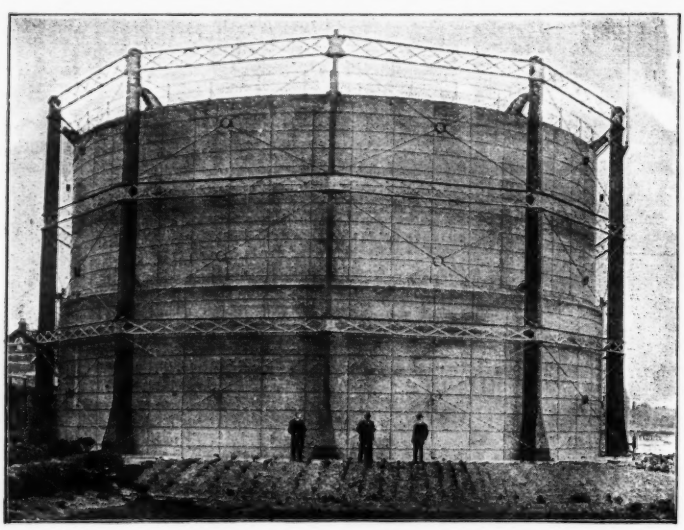

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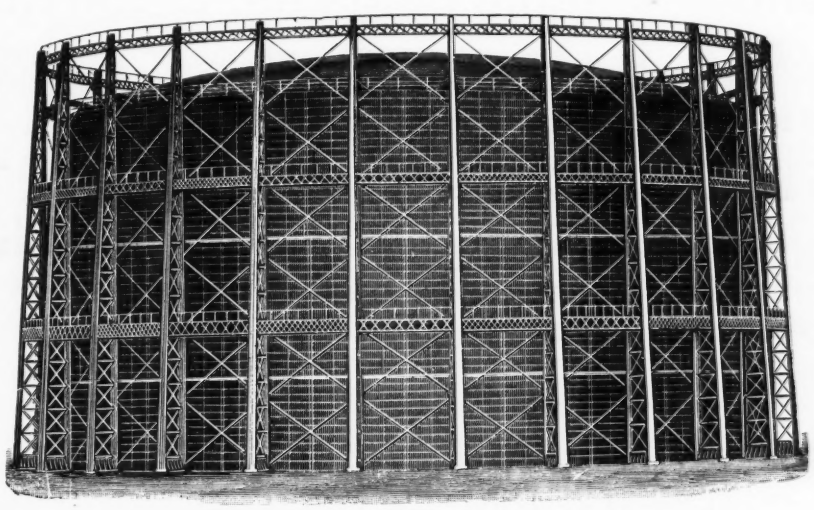

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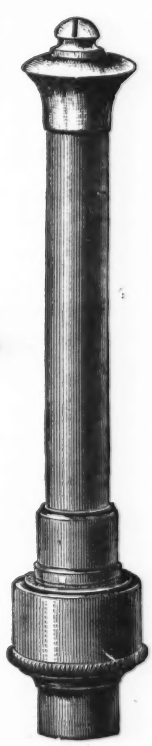

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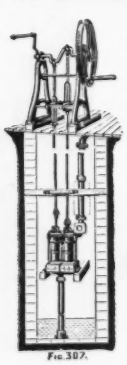

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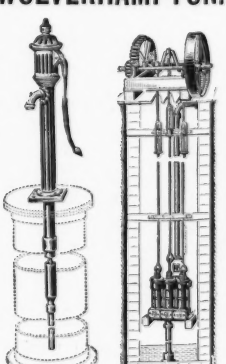

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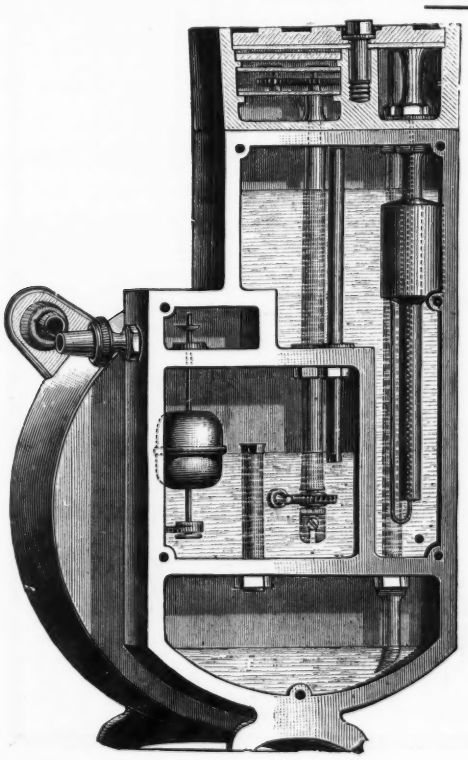

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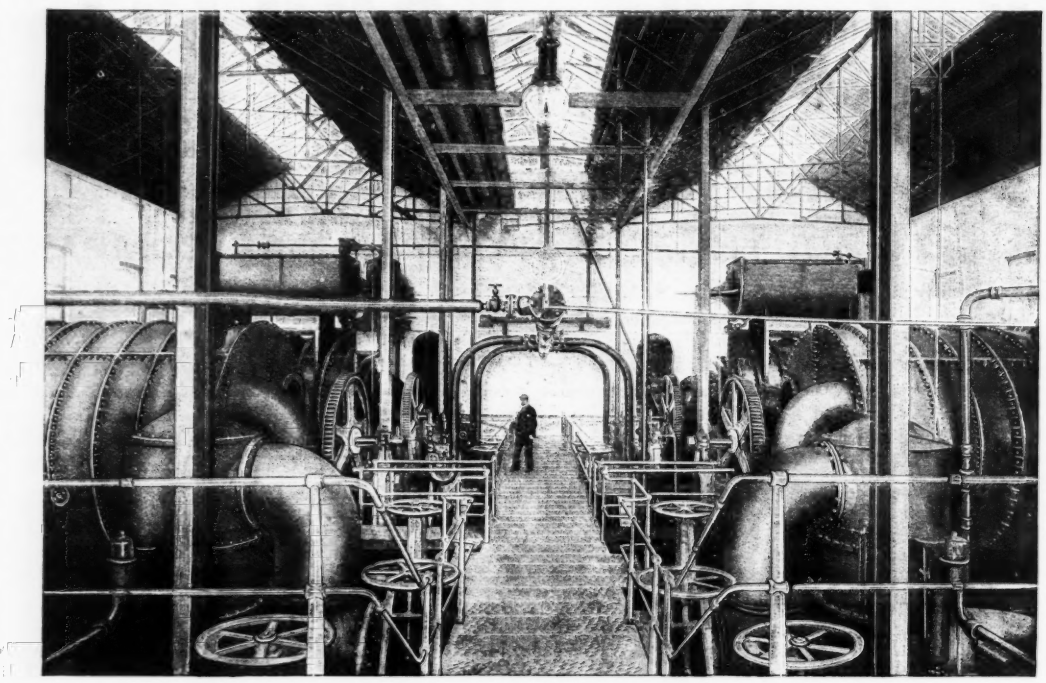

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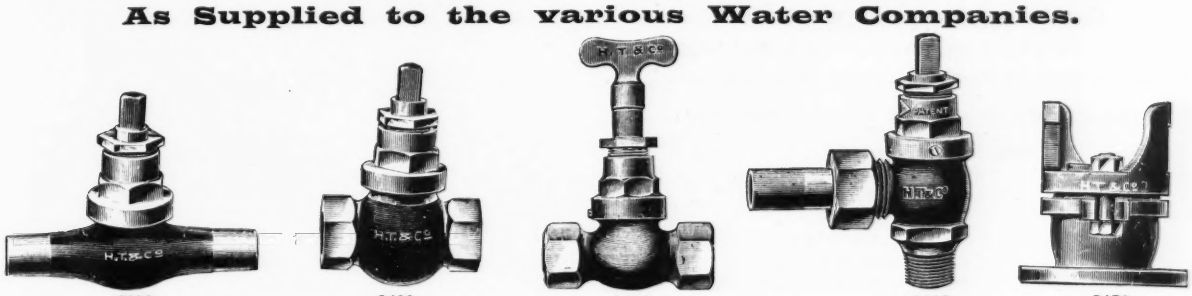

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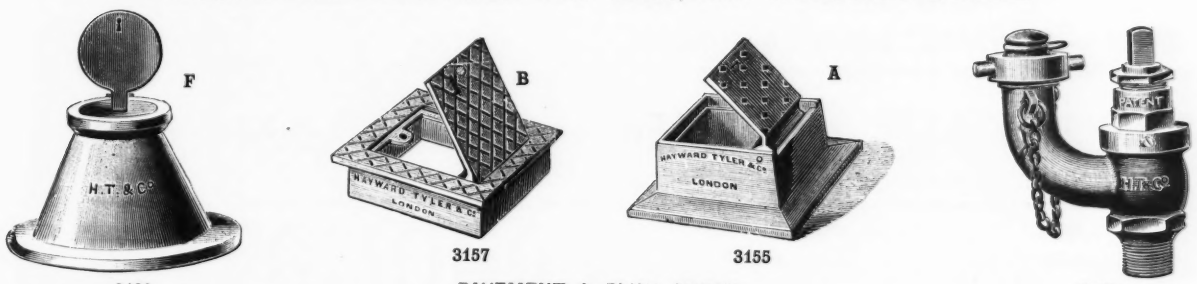

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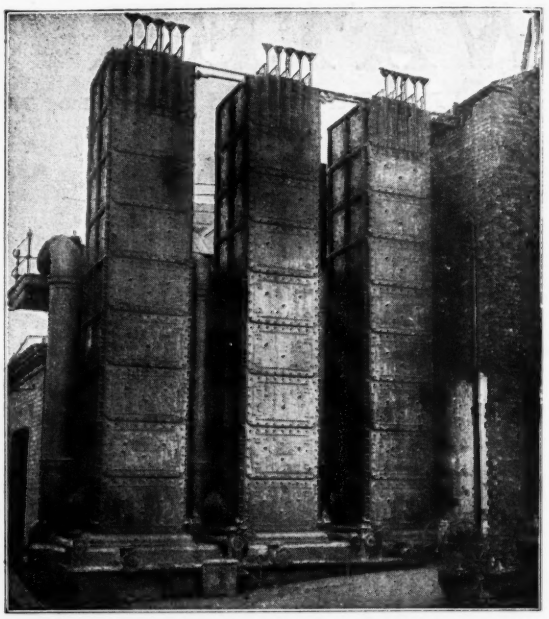

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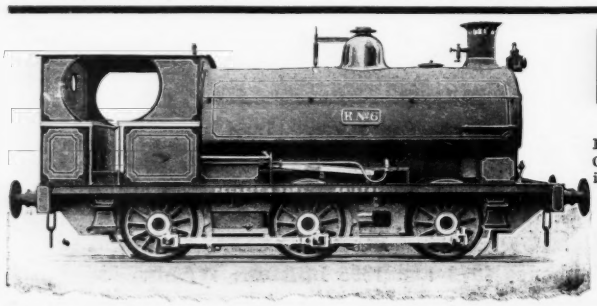

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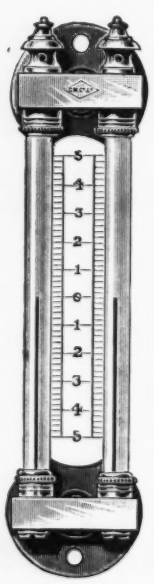

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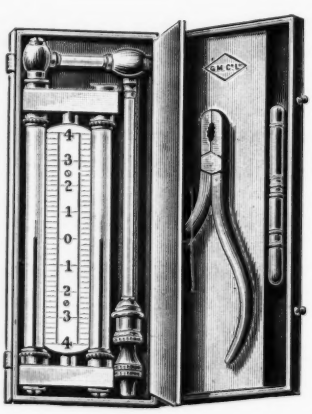

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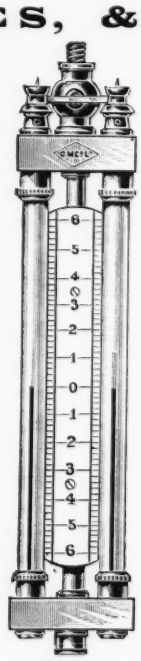

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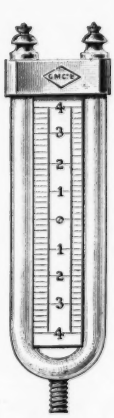

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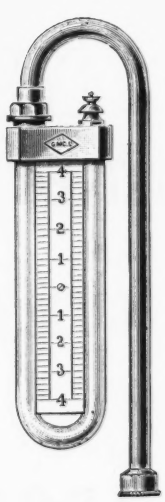

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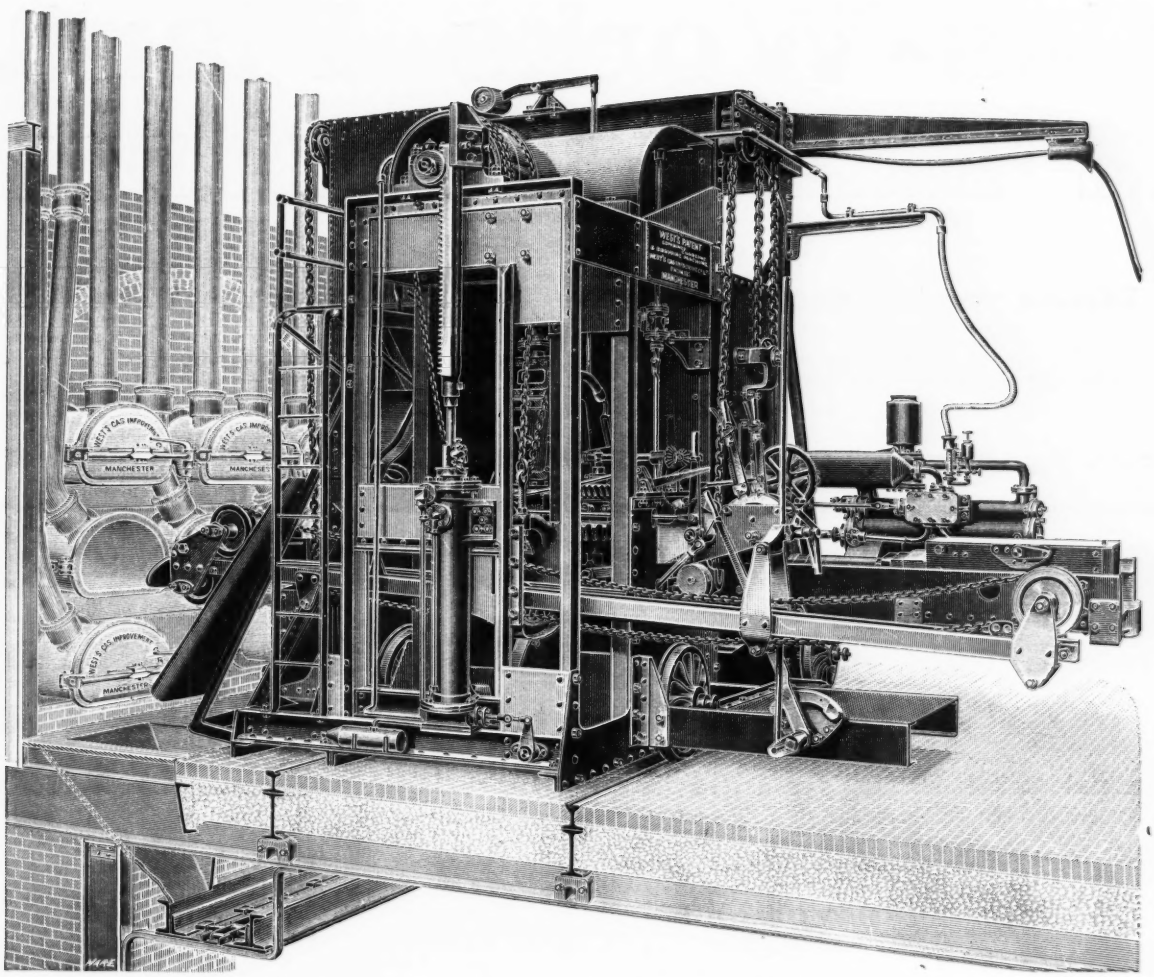

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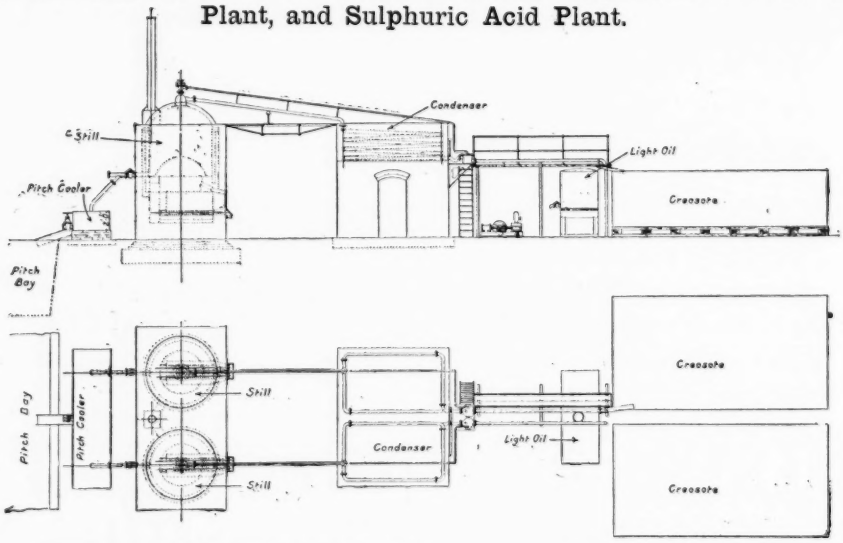

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Wilton's Patent Neutralizing Apparatus for the Waste Gases from Sulphate of Ammonia Plant.

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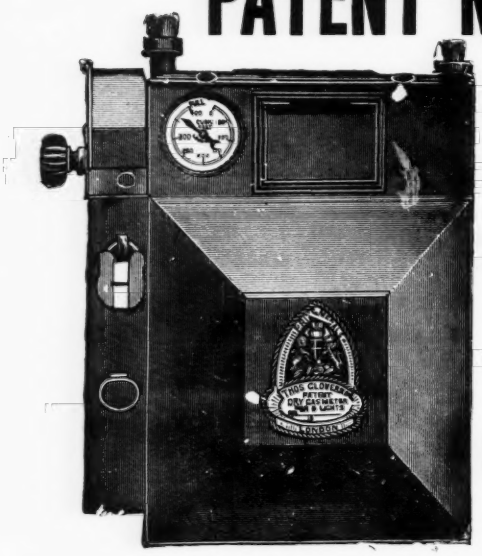

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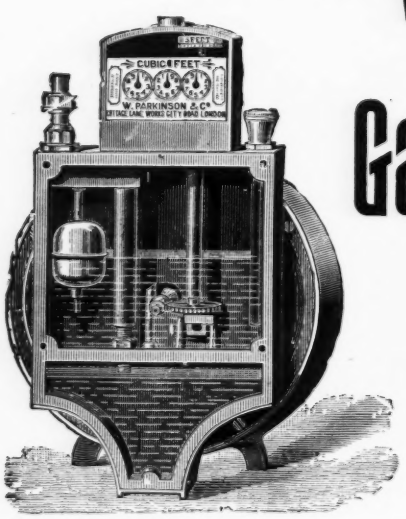

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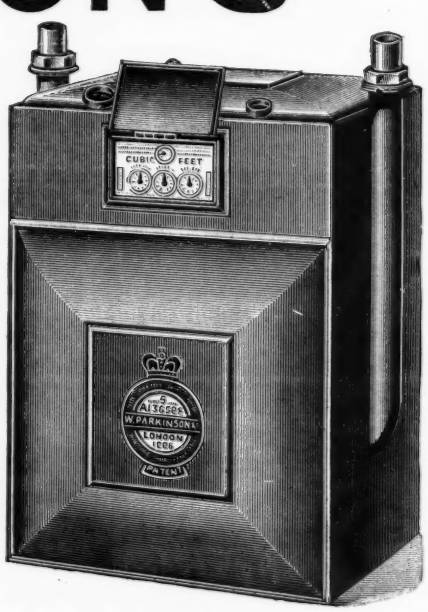

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EDITORIAL NOTES.

A Study of Superannuation Allowances.

THERE has just been issued a Blue-Book containing the report of the Royal Commission on Superannuation in the Civil Service, which should be in the hands of all those who are in any way interested in the formation and administration of superannuation funds. This category includes the officials of gas and water undertakings, who constitute the majority of regular readers of the "JOURNAL;" and therefore no further explanation need be offered of the importance we are disposed to attach to the report. The Royal Commission was appointed in November of last year; so that no delay has occurred in discharging the reference, the terms of which were at once simple and comprehensive. The Commissioners were directed to inquire whether it is possible so to amend the existing system of superannuation of persons in the service of the State as to confer greater and more uniform advantages on those to whom it applies, without unduly increasing the burden imposed on the taxpayer. In the course of their investigation, the Commissioners took evidence respecting the pension funds, or the schemes of a similar nature, applying to the officials of the principal railway and other companies, and British municipalities. It is to be remembered that the Civil Service scale of superannuation is adopted by statute in many cases, and especially is applied to gas and water works officials. This scale is set out in the opening paragraphs of the report, and may be summarized as apportioning to the pensioner an allowance "calculated at one-sixtieth of his retiring salary (or, in cer- "tain cases, of his average salary for the last three years) "for each complete year of service, subject to a maximum "of forty-sixtieths." Civil servants retired on account of ill-health after less than ten years' service are qualified for a gratuity of one month's pay for every year of service. Exceptional treatment is awarded to certain classes of civil servants, among others to the holders of professional offices appointed at a riper age than that at which public service ordinarily begins.

There has been discontent in the Civil Service as to the total remuneration received in the forms of pay and pension; it being contended that the rate of pay is unduly diminished to meet the pension to which the public servant is contingently entitled. Even granting that the rate of pension is reasonable, it is of no benefit to those who die in the service, and therefore never come upon the superannuated list. The dissatisfaction felt in regard to this arrangement is sympathized with by the Commissioners, who agree that a pension system only is not fair. They see in this consideration the reason why, in most of the superannuation schemes recently established by municipal bodies and commercial companies, supplementary provisions have been introduced providing cash payments in case of death and of some other contingencies. While approving of these arrangements, however, the Commissioners are careful to point out that no system of remuneration for services of an official nature could provide for all the chances of life. The officers themselves must exercise foresight and prudence in their own behalf and for the sake of those dependent upon them. It is satisfactory to know that a very great deal is done in this way, the chief particulars of the means employed being given in the report.

Having regard to the difference between a contingent pension and life assurance, and admitting the superior advantages of the latter, the Commissioners considered the question whether, out of funds to be obtained by diminishing the former, it might not be possible to provide assistance for the representatives of those who die in the service. It was ascertained that there would be no objection to a moderate reduction of the pension—say, by making the basis of calculation one-eightieth instead of one-sixtieth for every year of service; the money so saved being distributed as indicated. The question thereupon arose as to what this might amount to; and the assistance of Mr. H. W. Manly, an Actuary, was called for to work it out. The result is given in the report at much greater length than we can spare for repeating it here; but we can truly describe it as not the least valuable part of the document. Shortly stated, the Commissioners' recommendation on Mr. Manly's figures is, that in all cases (salaried or wage-paid servants inclusive) a year's pay should be given on death during or after service, or on premature retirement, besides a pension after full service calculated on the reduced scale. The uniformity and simplicity of this proposal, which is that of the majority of the Commissioners, is not its least admirable feature. Its terms are to be commended to the careful study of all British Municipalities and Boards of Directors. Two of the Commissioners—Sir Ralph Knox and Mr. Brabrook—disagree with the majority report, and submit one of their own, which recommends that the existing scale of pensions should be unchanged, leaving to the officials themselves the making of provision at death by way of life assurance. There is much weight in this advice, more especially having regard to the different requirements of the married and single men, and men of various ages. The two Commissioners also lay stress on the desirability of encouraging young men to insure their lives at the earliest possible period; and with this most people will agree. All these are most serious questions for members of the official classes, whether belonging to the public service or to that larger civil service which is equally deserving of fair treatment and honourable consideration.

Though it lay outside the reference to the Commission, one would like to hear the views of individual Commissioners on the merits of the opposite system, favoured by the London County Council and some other public bodies, of abolishing all retiring allowances and pensions in their service. Something can be said for this drastic dealing with the subject of pensions, or the Council could not have adopted it. Yet it may be remarked of it that it is still upon its trial, and that its superior advantages to the pension system are not universally conceded. Throughout the present report, the good effect of the national system is confessed, and Sir Ralph Knox and Mr. Brabrook in particular go so far as to declare their conviction that "it "is not only under this system, but because of it, that the "English Civil Service has earned its high reputation for "fidelity, zeal, and independence." The majority report further sets forth that it is advantageous to the State that part of the remuneration of its servants should take the form of a pension, "as there is thus secured an inducement "to maintain continuous service on the part of the servant, "and a facility on the part of the State to dispense with "further services if age or infirmity renders them less "efficient." The London County Council evidently think differently; and the *crux* of their system will probably be found to be in the matter of the independence, or the lack of it, in officials deprived of "prospects." Such officials must be exposed to the temptation to drive the hardest bargains they possibly can with their temporary employers, in the way of turning every emergency of the service to their own profit; and the rewards of time-serving must be difficult to shun by officials who hold their positions by favour of a shifting majority. The London County Council are credibly believed to have experience of both these kinds of drawback to their system; and other public bodies who might be tempted to follow their example would be well advised to investigate its cost and its operation.

The North of England Association Meeting.

OF the ability of the North of England Gas Managers' Association to maintain a high standard in the production of matter of interest to all concerned in gas manufacture—notwithstanding the frequency of their meetings—there is no need to speak at this time of day. The Association has always been a vigorous one. The generation of active workers who joined it in its early days have almost all passed away, although, happily, a few remain to grace the

meetings with their presence. A new generation has taken their place; and of them it may truly be said that in ability and in zeal they are not outstripped in any of the Provincial Associations. The presidential chair is this year occupied by Mr. F. P. Tarratt, of Darlington, who is not only himself a young man, but is also one of the latest introductions to the membership of the Association; his earlier connection with gas manufacture having been in a southern gas-works. He gave an address at the meeting in Darlington on Saturday last of a nature which is always welcome—not bristling with theories more or less visionary, but full of conclusions ripened from observation as to the outcome of adopted methods and the trend of events. In this connection, we have but to refer to his observations as to the employment of Mond gas, the use of gas-engines, and the development of day consumption. In reading his remarks, there is a feeling that solid ground is being trodden upon. In these days of change, though happily not of decay, in the gas industry, such a thoughtful address as that of Mr. Tarratt is the kind that is of most service. Its influence is towards the steadying of movements which, unless guided by wisdom like that he displays, might be apt to lead into ways which would not be profitable.

In Mr. A. C. Hovey, of North Shields, the Association possesses another young member who, by the paper which he read, shows that he is a master in his profession. Mr. Hovey was describing work with which he has been associated as Assistant-Manager, yet he may be said to have risen to the height of an original designer, instead of remaining at the level of one carrying out the ideas of another. Such a position could only be attained in a case where there was the utmost accord between the chief and his assistant. The works are the works of Mr. W. Hardie, but the paper was the paper of Mr. Hovey. It was a monument of care and diligence—crammed full of details, and with reasons for every detail. One method of reckoning its value is to be found in the fact that, although it occupied an hour and a quarter in delivery, the interest of the members never flagged. The letterpress speaks for itself, but the illustrations—some seventy in number, and which cannot of course all be reproduced—were of a nature so elaborate and complete as to be of themselves a work of perfection. Ordinary commendation is not sufficient for them; they were truly superlative.

It is gratifying to note that a beginning is likely to be made with the teaching of gas manufacture as one of the technical subjects in the Rutherford College in Newcastle. There is an abundant field in the district from which to draw pupils—one of the most favoured districts in the United Kingdom in this respect; and the scheme should be a success from the start. The wonder is that it has been so late in being thought of. The boon which it will confer upon the studious youth of Tyneside will be inestimable. Similar ventures elsewhere have proved highly beneficial, and there is no reason why this at Newcastle should not be so.

Statistics of London Gas Supply.

The imposing volume of London Statistics lately issued by the London County Council contains some instructive particulars relating to the gas supply of the Metropolis. The Gas Companies listed as supplying the Metropolitan area are seven in number; the additions to the London Companies proper consisting of the Brentford, Crystal Palace District, Mitcham and Wimbledon, and Wandsworth and Putney Companies. It may surprise some people to learn from these statistics that the South Metropolitan Company's area is larger than that of the Gaslight and Coke Company; the figures being 51·2 and 43·2 square miles respectively. The populations served are, however, in the reverse order of magnitude; the Gaslight and Coke Company catering for upwards of 2,400,000 people, while the South Metropolitan Company's district at present carries about a million less. Of inhabited houses in the year 1901, the Gaslight and Coke Company might be required to make connections to about 280,000; while the South Metropolitan could be compelled to lay services to not more than 194,297. On these figures, there is plenty of room for South Metropolitan growth. The Commercial Gas Company serve a population of 473,673, occupying 54,253 houses. The comparative proportion of inhabitants to houses is, for the three Metropolitan Companies in order of size, 8·5, 7·2, and 8·6. Those who know London will very readily understand these figures; South London being a region of small houses, with a large suburban component, while the region round Stepney is notoriously the most crowded in the Metropolis.

One does not quite see why the figures relating to the Metropolitan Companies only come down to the close of the year 1901. We are approaching the end of 1903; and if statistics of this kind are worth getting out at all, they are the better for being fresh. The data given here appeared long ago in the "Journal;" but the arrangement of the figures in this statement is different. The chief amounts are for five years, which is rather useful, as showing the alterations at a glance. Of course, 1901 was a bumper year for the expenses of gas manufacture; but it is striking to note that the increase for the entire quinquennium was upwards of 1½ millions sterling. Those luxuries, the Gas Referees, with the testing-stations and the official audit, have cost from £4500 to close upon £6000 a year. The difference here must be due to the alteration in the method of testing. The statistics of Suburban Companies are taken from the Board of Trade returns.

The first observation of the statistician on the figures is that the prices charged for gas throughout London vary considerably. Noticing the fact that the Gaslight and Coke Company are under obligations to supply their area south of the Thames at the current South Metropolitan price, the somewhat invidious explanation is offered that "the resulting deficiency is made good, not out of the "dividends, but by an increased price being charged to "the consumers on the north of the Thames." This is, of course, the consumers' grievance; but it would have been as fair, and perhaps more useful, to add that the lower price governs the price of gas for public lighting north of the Thames. The charges for meters by the different Companies vary considerably—being double in some districts as compared with the adjoining area. In order to throw further light upon this subject (or to increase the confusion, according as one takes it), the charges for gas in the county boroughs which had a population of more than 150,000 at the census of 1901 are given; the municipal supplies being classed separately from the companies. But why Kingston-upon-Hull should be included among the municipally-supplied boroughs is a mystery, seeing that by far the greater part of the gas sold in the town is directly supplied by the British Gaslight Company. The testing of meter indices is mentioned, and it is reported that the inspectors found 14 incorrect in the year 1901-2. As might be supposed, when an index is wrong, it is very wrong indeed; and the amount of error in these cases was large—ranging from 60 per cent. in favour of the consumer to no less than 150 per cent. on the other side.

A Warning to Borrowers.

By all accounts, there was something of a small panic on the Stock Exchange last week, and great relief was experienced when the settlement was completed without any sensational failures. Still, the crisis is scarcely over; and it is pretty generally agreed that the financial position is anything but satisfactory. With Consols written down to 85, and a Bank rate of 4 per cent., there is no money going for fresh capital issues; and it is said everywhere that anything raised this side of Christmas will be dear. It was reported from America that 1000 million dollars had disappeared from the valuation of a few leading railway and other stocks during the last few months. Our readers will not need reminding how much gas stocks have fallen in a month. It is probably true, as our Stock Exchange correspondent observed last week, that there is no real reason for this weakness. But the fact remains; and it is extremely awkward for those undertakings which need more capital. By common consent, the cause of the trouble is referred by the authorities on the subject to the exaggerated issues of colonial and municipal stocks. The banks have found it profitable to underwrite these issues, up to a point; but the announcement made a few months ago that this process must cease, while it was the greatest set-back that municipal trading has ever received, preluded the state of things from which the Money Market is just now suffering. It has transpired that vast amounts of these corporation stocks never got into the private investor's possession at all. He did not require them, and the underwriters had to keep them, which was not in the programme. The ordinary investor is understood to like this class of securities fairly well; and it is of the last importance that nothing should be done,

by the inconsiderate forcing of sales or otherwise, to shake his confidence in them. If he is tenderly treated, he will in time absorb all the stocks he would like to have; but the process must be slow, seeing that the money needed for the purpose is all savings. The mischief is that there is just for the moment far too much of this kind of scrip in hands that must get rid of it at the earliest suitable opportunity. Underwriting entails unloading in due course; and accordingly the markets keep flat.

The ordinary investor in gilt-edged securities wants above all to feel that his money is safe, and that he can realize it at will for at least as much as he paid away, and if possible a little more. For this satisfaction he is contented with a small return on his investment; but this condition of things in relation to such securities as English Corporation stocks seems to be changing. One writer declares that the ordinary investor of savings must be careful, or he will find these investments about as risky as anything he can select. It is again the modern practice of underwriting that is responsible for this alteration. It means that quoted prices do not convey the real position, inasmuch as those who know the truth are aware that there are no buyers at the price, but merely sellers who will take less eventually when they cannot any longer stave off unloading. The only possible relief to the present tension is for Colonial Governments and British Municipalities to go slow for a little while, and keep off the market. They must let the public savings go the usual way, if they desire to obtain any more money from the customary sources. Otherwise, if the borrowing process is persisted in, 3 per cent. stocks will go down to 90, and even lower and lower. Some pessimists actually talk of 75 for this grade of security; "and quite high enough, considering the "increased rates and taxes an investor is now having to "pay." Possibly, from a "bear" speculator's standpoint; but many a town hall will be shaken to its foundations if ever this quotation for municipal stock gets upon the paper. Nor will the state of many gas offices be much more comfortable under the same influences.

New Gas-Works and Structural Costs.

There can be nothing but general agreement with the view (expressed elsewhere) that the paper Mr. A. C. Hovey contributed to the proceedings of the North of England Association on Saturday is a valuable one, and that value is not only present but prospective. It is a paper that is bound to be frequently referred to in future for suggestion and comparison. Omitting trivial details, the author has given (as it were) a synopsis, amounting almost to an outline of a specification, of a complete gas-works (excepting gasholders) for an output of 2½ million cubic feet per day, with the costs for every section of the plant—in the total and per mouthpiece, per ton of coal, per 1000 cubic feet, and the capital charges per 1000 cubic feet at 4 per cent., and some separate and further structural costs are supplied here and there in the text of the paper. There is nothing hypothetical about any one part of it; the new works described being those which Mr. William Hardie, the Engineer of the Tynemouth Gas-Works (whose assistant Mr. Hovey is), carried out for his Company, and brought into use now close upon twelve months ago. The costs like the works have, therefore, a real existence; and when these costs are studied, no one will be surprised that they are so freely published in such an anatomized form, for in the new works, notwithstanding that they have had to be constructed of bold design to meet the severe climatic conditions of the North-East Coast, the Company have obtained excellent value at a very reasonable outlay. We could wish that engineers would publish the costs of new works a little more frequently. There exists a good deal of reticence in this respect—just as there does in regard to the publication of complete analyses of working costs. This reserve, of course, is due to the unjust use that is made of such figures, and the refusal or neglect to give fair and full consideration to the position at the time of construction of the market for material, the situation and conditions of the site and surroundings, and other matters which tend to make the capital costs rise and fall per unit of output. If chairmen, directors, and committeemen who are struck with a fancy for dissecting their own costs for the purpose of comparing with those at Tynemouth will remember these points, they will perhaps arrive at a result more satisfactory to themselves and others concerned. The notes in the paper on the analysis table must also be taken into account.

A Good Investment; A Reversible Condenser.

Not only does Mr. Hovey's paper show that at Tynemouth his chief has built works at a low capital cost, but he proves that the Company have made in them a very profitable investment. This is seen first in the section referring to the retort-settings, where it appears that, compared with direct-fired furnaces in No. 1 house, there has been, with the new regenerative furnaces, a reduction in the expenditure of fuel of no less than 36½ per cent.; and Mr. Hovey mentions—it may, we presume, be taken as a consequence—that the sale of coke per ton of coal for the first half of this year was 17½ per cent. greater than last year. But this is only one item of saving. Mr. Hovey exhibits plainly (in a later and engrossing section of his paper) that the total reduction in retort-house expenses owing to the employment of machinery is 1s. 11·43d. per ton of coal carbonized; and, deducting all charges, there is a net reduction in manufacturing costs of 1s. 2·23d. per ton, or 1·35d. per 1000 cubic feet of gas, when 10,500 feet per ton are made. There is the proof of success as found by the financial test. The mechanical arrangements that Mr. Hardie has adopted have time and experience elsewhere to commend them; and there is no remark to be made upon them outside of the paper. The statement of Mr. Hovey as to the use of the reversible condenser, on the principle described by Mr. Charles Carpenter in his communications on the subject to the Southern Association, is interesting. For several weeks after the works were started, and previous to the reversing operations, the average of a number of tests for naphthalene in the purified gas distributed was 15·68 grains per 100 cubic feet; while the result obtained from 24 consecutive tests since this condenser has been regularly reversed has been 5·43 grains. It will be hoped that Mr. Hardie will keep a close watch upon the conduct of the condenser, and a record of temperatures and the tests made for naphthalene, over (say) a complete twelve months, and give his colleagues the notes. It may be repeated that Mr. Hovey's paper is one of considerable value from the engineering point of view; and it is not wanting in interest to those whose duties are purely administrative.

Slighting the Ratepayer in Dublin.

A few weeks ago, when referring to an article in defence of municipal trading which had appeared in the pages of a contemporary, we took occasion—while agreeing with the writer's contention that it would be well if the problem were always approached with a due sense of the obligations of the community to those who performed municipal work—to suggest that there was at least an equal duty cast upon town councillors to remember their obligations to those who elected them as their representatives. This expression of opinion was based upon what would seem to be the very reasonable view that members of local governing authorities are the servants, and not the masters, of those who appoint them. The ruling party in the Corporation of Dublin, however, do not appear to recognize the existence of any such obligation on their part to the unfortunate ratepayers of the city, judging from the report of the proceedings at a Local Government Board inquiry opened last week. The main object of the inquiry was the raising of a further large loan on account of the very extravagant electric lighting scheme with which the citizens are now being burdened. Having gone so far with the erection of this monument to their folly, possibly the only thing to be done is for the Corporation to complete it; and, after all, the amount of the loan now desired (£48,000) cannot be of vital importance, seeing that the Board have already sanctioned the raising of £254,000 for carrying out the scheme. This, however, is not the point. There is not the slightest doubt that the Corporation would have been very much wiser had they left the enterprise altogether alone; but even were the undertaking as promising as its promoters would make believe, there would still be no excuse whatever for the treatment meted out in connection with the inquiry to those of the ratepayers who hold a different view. Naturally, the revelations which have recently been made regarding the municipal affairs of Dublin, and the rapidly rising rates, have given birth to a widespread feeling of anxiety on the part of those who have to bear the burden; and the result has been the manifestation of a much keener interest than formerly existed in the doings of the Corporation. Consequent on this, two Ratepayers' Associations briefed Counsel to appear at the inquiry in opposition to the application; and these gentlemen

made the very modest request that they should be supplied with copies of the voluminous documents prepared by Mr. Robert Hammond, the Consulting Engineer to the Corporation, for the purposes of his evidence. With this request, however, the Lord Mayor did his very best to prevent compliance; and a strong effort was even made to get one of the Associations shut out from the inquiry altogether, on the plea that they were a newly-formed body who were only anxious to find a means of advertising themselves, and that it was not known who was at the back of the movement. Such tactics as these are, to say the least, anything but creditable to those indulging in them; and in this case they will not help to restore the sadly shaken confidence of the ratepayers of Dublin in the ability of the majority of the members of the Council to properly manage the city's affairs.

Old and New Charging Methods.

It is strange that there should have been such a burst of enthusiasm in the development of retort-charging apparatus of late; and the result is bound to be that, sooner or later, we shall find new comers running very closely on the tracks of those who have preceded them. A translation of a communication presented at the last meeting of the Dutch Gas Engineers' Association, given on another page, describes two charging arrangements—the first of which was constructed some few years ago. If there is one point of novelty about this one, it appears to be that the scoop is made of the same shape as the section of the retort, and that it is divided down the centre—the opening of the scoop depositing the coal in the retort. As applied to machinery of a larger type, this idea is not new, though the movements accomplishing it may be. In the second type of apparatus, we have a projector consisting of a drum in which there are two rapidly revolving fans, which drive the coal into the retort through a shoot pushed up close to the mouth of the retort. The fans are fed with coal by a screw conveyor from a hopper. There is no reduction of the speed of the fans; but the velocity of the discharge of the coal into the retort as the charge nears the mouthpiece is retarded by the inclination of the shoot and the resistance of a falling flap. The performance of this machine is claimed to be similar to those of the two projectors which have been the subjects of full description in the "JOURNAL." Interested engineers will look at the description and illustrations very attentively.

Incandescent Matters.

In the "JOURNAL" for Sept. 15, we gave circulation to a statement published by the "Manchester Courier" to the effect that negotiations were proceeding in Berlin for the formation of a combine of incandescent mantle manufacturers. From sources in immediate communication with the incandescent industry in Germany, comes the information that there is not, so far as is known, a spark of truth in the suggestion as to the revival of the old project. The whole position of the German incandescent mantle trade is declared to be against the idea. Competition and rivalry are now so keen, that some of the principal mantle makers in Germany would not consent to be tied by any working arrangement with their opponents in trade; so that a combine to control the mantle market appears to be very remote indeed. We hope appearances may be relied upon. When the scheme was last suggested, it was found that the ramifications of the business were too great to bring about such a cohesion of the trade as would give absolute confidence; there were bound to be loopholes to frustrate the attainment of the end desired. Combinations never have for long succeeded, and never will. It is believed that the paragraph referred to was inspired by someone interested in incandescent matters, but not commercially. The monazite sand question is not making any rapid advance—in fact, the dispute between the Central Government of Brazil and the State Government of Espirito Santo as to the ownership of the foreshore from which the sand is taken, and the submission of the question to legal determination, will delay the new contract somewhat. Meanwhile, the permission given to the old concessionaire to export an additional quantity of 1600 tons of monazite has relieved the position somewhat; but it has had no effect in modifying the price of thorium. Of course, the 1600 tons have been, or are being, shipped to the little circle controlling the supply of thorium in Germany. On good authority, we hear that an agent has gone out to Brazil from Germany to look further into the situation. It is suggested that, if there is a corner in anything in the incandescent trade in the near future, it will spring out of ramie. The demand for ramie mantles has grown enormously of late; and most large buyers are specifying ramie mantles in their orders. The price of the material has risen; but ramie is not such a necessity that a corner in it could not be met by large purchasers boycotting it (by using cotton mantles) for a sufficient time to break down any attempt in that direction.

Incandescent Gas Aids the Electric Light.

Whatever light the Prime Minister may have thrown on the great fiscal question now before the country by the address he delivered last Thursday, at a meeting of the National Conservative Union, in the Artillery Drill Hall, Sheffield, very little appears to have been afforded him, by the electric arc lamps in the hall, for getting a good view of the extent of his audience and of the effect of his discourse upon them. We learn from the report of the proceedings in the "Yorkshire Post" that "huge arc lamps gave doubtful illumination to the hall;" and the opinion is expressed that "their spluttering must have proved as irritating to the speaker as it was disconcerting to the large army of reporters below." We can quite understand that the peculiar concomitant of arc lighting referred to must have been disconcerting. The reporter's work on such an occasion as the one in question is quite arduous enough, in all conscience, without having his mind distracted by unseemly sounds. The writer of the comments on the meeting, in the same paper, placed on record the fact that "quivering arc lights lit up the unlovely interior with an uncertain glimmer," at which there was some grumbling. In consequence of this, a Steward appealed to the Secretary of the Union for more light. Whereupon this official straightway gave the word, "and the illumination [?] of the arc lights was supplemented by that of the incandescent gas-lamps." We read that a half-ironical cheer greeted this master-stroke on the part of the Secretary. It only required a failure of the electric light in an important part of the address—and such a mishap is not at all unknown in the history of this illuminant—to change the irony into indignation. Fortunately this did not happen.

Industrial Gas.

The question of differential prices for gas is one that has not come into the range of general discussion for a long time now; and it is only casually that one hears of it. However, things have largely changed since the days when the advisers of gas administrators used to stoutly defend the uniform price. Competition in various directions has to-day compelled gas suppliers, whether it runs against the grain or not, to look closer to the concessions they can make to substantial consumers in order to retain their custom; and to no districts does this remark apply with so much force as those in which industrial operations are centred. Producer gas and electricity urge their claims for the consideration of the manufacturer; and every means must be taken to outrival them. Mr. J. Horsley Palmer referred to the matter in his speech to the shareholders of the British Gaslight Company last Wednesday. The Company, at their various stations, have long pursued the cheap-gas policy, and have done well. Mr. Palmer now announces that in the Potteries district the Board have reduced the price for lighting purposes by 2d. per 1000 cubic feet, and for industrial use by 3d. In his opinion, it behoves all suppliers of gas—whether in London or elsewhere—to have a separate price for gas used in industrial operations. This remark calls to mind an instance which was brought to notice only recently, of a printing establishment in London which, using gas-engines when the whole of the machinery is running, finds it cheaper when only a small part is working to use electricity as the motive power. This means a double installation of driving plant and the patronage of two sources of energy. We do not think in that case there is any concession for what Mr. Palmer calls "industrial gas." Had there been, perhaps electricity would never have gained entry into the premises. Apart from this particular feature, the British Gaslight Company have done remarkably well during the past half year—good increases of business have been obtained (the excellent one of 11¾ per cent. at Norwich), the financial position of the

undertakings has been strengthened, and works extensions and improvements have been going on apace. In short, the prospect before the shareholders is a pleasant one.

Birmingham and its Elective Auditor.

Some of the witnesses examined before the recent Parliamentary Committee on Municipal Trading had anything but an easy time; and conspicuous in this respect was Mr. Floyd, the Elective Auditor for the City of Birmingham, who apparently approached his task in a "first he would, and then he wouldn't" frame of mind. More than one member of the Committee cross-examined Mr. Floyd with all the ardour of counsel "for the other side" in a Court of Law; and the result was that, while with one breath this gentleman seemed desirous of bringing serious charges against the Corporation Gas Department regarding the preparation of the accounts, with the next he appeared equally anxious to have it understood that, in his opinion, there was nothing whatever amiss. He first of all talked all too glibly of there being "good presumptive evidence" of manipulation of the accounts; but when pressed, he showed the strongest possible disinclination to bring his assertions to their logical conclusion. This was hardly a fair manner of dealing with such a serious state of affairs as he hinted at; and it would have been much better that Mr. Floyd should not have referred to these matters at all, than that he should have treated them as he did. Either the "juggling" exists, or it does not; and, as Auditor, Mr. Floyd should have taken steps to satisfy himself conclusively on the point. As, it seems, he was not able to do so, one must feel inclined to agree—as far as Birmingham is concerned, at any rate—with his opinion that the system of elective auditors is "simply a farce." But, at the same time, it must be admitted that the work of auditing might be done more thoroughly than, on his own showing, Mr. Floyd has done it; and in that event it might perhaps be more effective. The fee paid to the Elective Auditor is only something over £50 a year; and his method has been, as he says, "to put in full value for the money he received"—that is, he has given only a few days each year to the work. Obviously, this would be too short a time to allow of a thorough audit being made; and consequently Mr. Floyd has not been in the habit of going through all the vouchers relating to the accounts, though he admits that he could have done so if he had chosen. This avowal led Sir James Woodhouse to read out one of the certificates signed by the witness, which was in the following terms: "I hereby certify that I have duly audited the accounts of the receipts and payments of the Treasurer of the City of Birmingham for the year ended March 31, 1902, with the necessary vouchers and papers, and have found the same correct." Sir James showed by his questions that he held very strong views with regard to the accuracy of this certificate; and though it is possible that Mr. Floyd was correct in his contention that it deceived nobody, it is a pity that he did not make more sure of his own position before indulging in his faint-hearted attack upon the business methods of the Corporation. The nature of this attack will be seen from the summary of the evidence before the Committee which appears in another part of to-day's issue.

The Value of Mantle Ashes.—Mr. Julius Norden, of Messrs. Julius Norden and Co. (which firm is also known as the United Chemical Works), calls attention to a matter in connection with incandescent gas lighting which, he points out, may at first sight appear to be a small one, but when regarded from a collective point of view is really a large one. He says that the gas companies and corporations of this country do not appreciate the value that exists in the remains of incandescent mantles; and if it is brought home to them, they may see that it is worth their while to collect and save them. If the ashes are fairly clean, his Company can afford to pay a minimum of 10s. a pound for them; sometimes more, according to their condition. From his experience, he declares that, according to the size of the public lighting district, it is not a difficult thing to collect from (say) 10 to 50 lbs. of mantle ashes in a year; and this can easily be done by the lamp attendants being supplied with a little bag in which to drop the fractured mantles. Chemical firms like his own are able to put the ashes to good use by extracting the thorium. It may be worth while to give this suggestion a trial, even if only for the purpose of satisfying oneself whether the saving would more than compensate for the little attendant trouble.

WATER AFFAIRS.

The London Water Board Resume Work.

The Metropolitan Water Board resumed their sittings last Friday, after the vacation, with a slight diminution in their numbers. Death has removed one member, in the person of Mr. J. H. Brass, who represented the Chelsea Borough Council; while Mr. H. P. Harris and Mr. Henry Clarke, two of the representatives of the London County Council, have resigned, following the example of Mr. Henry Burt, who a few weeks ago vacated his seat for Hornsey and Wood Green, which Mr. Dix Lewis has taken. It is curious that the three last-named gentlemen are Moderates—Mr. Harris having been at one time leader of the party at Spring Gardens; and the curiosity acquires a certain significance when the circumstance is borne in mind that another Moderate leader—Mr. D. J. Morgan, M.P.—has given up the chairmanship of the Finance Committee. Of course, good and sufficient reasons are assigned for these changes; and if the gentlemen concerned did not all hold practically the same views on the Metropolitan Water Question, one might be inclined to attach the fullest value to them. But in face of one of the last acts of the Board just before the recess, it is difficult to believe that the dissociation of three Moderate members from the further work of that body had not some connection with it.

To put forward so astounding a proposition as that contained in the Board's answer to the claim advanced by the East London Water Company—viz., that they did not intend to give the Company one penny compensation for their £1,720,000 of ordinary stock—was enough to scare every moderate-minded man; for it betrayed the continued existence of that desire to depreciate the works of the London Water Companies which has for years characterized the actions of a certain group of public men in the Metropolis. Such a proposition must have roused the indignation of the Directors and shareholders of the Company; but Colonel Lockwood, M.P., the Chairman, very judiciously refrained from making many comments on it at the half-yearly meeting last Thursday. In the course of a week or two, the claim and the answer will be before the Court of Arbitration, where each will be dealt with on its merits. The Board have already spent £30,000 in preparing their answers to the various claims; and a further sum of £14,000 was voted on Friday, to cover the expenditure up to the end of the current month. It may therefore be hoped that, in the interests of the ratepayers, negotiations now in progress in regard to certain portions of the Companies' undertakings which are to be transferred to outlying Local Authorities may result in their value being ascertained to the satisfaction of both parties to the bargain, without having to resort to the expensive process of arbitration for the purpose of determining it.

Another matter which occupied the attention of the members on Friday was brought before them in a report by the General Purposes Committee on the subject of the management of the water undertakings. The Committee are quite conscious that the Board do not know very much about this matter, which will, of course, be entrusted to Committees, and therefore they think it would be most helpful to them if they were in possession of particulars in regard to the methods of organization by which the undertakings are at present controlled and managed by the Boards of Directors of the various Companies. They accordingly recommended that the Clerk should be instructed to address the respective Secretaries, with the view of ascertaining the extent of the control exercised by the Directors and chief officers, and the general nature of the administrative machinery, and at the same time to ask for copies of any orders, rules, or regulations in force in this connection. Seeing that for years the management of the Companies has been roundly condemned—the article they purvey being often characterized as "liquid sewage" for which exorbitant and illegal charges are exacted by a set of grasping capitalists bent only on making dividends—and that, as one member of the Board pointed out, they are now practically at "arms' length" with the new authority, who are apparently doing their best to depreciate the value of the property they are to acquire, to go to them for instruction as to how to deal with it when they enter into possession, seems rather a remarkable proceeding. However, the Board sanctioned it; and we shall await with some interest

the result of the Clerk's application. The "Daily Express" thinks it would be "a marvellous example of good nature if "the Companies complied with the request."

A Culpable Rural District Council.

It is pretty generally recognized, by those who have given attention to hygienic questions, that the sanitary condition of many of the rural districts of this country is extremely unsatisfactory, and that one of the principal causes contributing thereto is the defective water supply. Some striking examples of this were cited at the Conference on Water Supplies and River Pollution which took place in London two years ago, in a paper by Miss Cochrane, who emphasized the fact that the sanitary authorities have more or less in their own hands the remedy for the evils the existence of which she pointed out, if they would but avail themselves of them. Unfortunately, they will not; and the result is that wells remain uncleaned, and surface impurities, as well as leakage from broken pipes and soakage from cesspits, &c., are left to drain into and pollute water that might be fairly good if properly cared for and protected. A remarkable instance of indifference on the part of a Rural District Council to the sanitation of the area under their control is furnished in a long report lately presented by Dr. Richard J. Reece to the Local Government Board, on the water supply, sanitary circumstances, and administration of the rural district of Thorne, in the West Riding. This is a small market town standing on the south side of a low mound of new red sandstone and gravel. The Stainforth and Keadby Canal passes through it, and the water supply is mainly obtained therefrom. Early in 1901, complaint was made to the Board by the County Council of the unwholesomeness of the water; and the Board repeatedly had communications with the Rural District Council upon the matter, but failed to get any satisfactory reply. They accordingly sent down Dr. Reece, whose report is a thorough censure of the Council as a sanitary authority.

The condition of Thorne has long been a cause of trouble to the Central Board. For nearly twenty years the water supply has been condemned by the local Medical Officers of Health; and the Board's Inspectors have at various times during this period fully endorsed their opinions. But though specific recommendations were made to the Rural Council with the view of improving the sanitary condition of the district, no attempt has been made, by them or by their predecessors, to carry them out—at all events, so far as the provision of a suitable public water service is concerned. Yet that this could be provided is shown by the fact that two private tube-wells sunk about nine years ago afford a sufficient and satisfactory supply. The truth is, as Dr. Reece does not hesitate to declare, that whenever anything requiring the expenditure of money on sanitary reform has come before the Council, the matter has been almost invariably shelved. For example, a few years ago it was found that the water yielded by deep wells sunk to the north of the town was unpalatable; but no steps were taken to render it fit for drinking by passing it through filters. The result of this indifference was that the population, looking upon the water with suspicion, were actually forced to revert to that taken from the canal, which Dr. Reece says is "polluted with "human excrement!" After this, one is not surprised at reading that no notice is taken by the Council of reports from the Medical Officer of Health and the Inspector of Nuisances, or that houses condemned by the former as unfit for human habitation remain occupied.

Before leaving the Crystal Palace District Gas Company, where he has been Assistant to Mr. Shoubridge for the past two years, to take up his new duties as Engineer of the Christchurch (*N.Z.*) Gas Company, Mr. Robert English was the recipient of a memento of his stay there, by the presentation to him, on behalf of the officers and workmen, of a gold albert chain, with a seal attached suitably inscribed. In the unavoidable absence of Mr. Shoubridge, Mr. Aubrey Ohren asked Mr. English to accept the gift, remarking upon the good fellowship that had always existed amongst them, and concluding by wishing him every success in his enlarged sphere of duties. Mr. Maltster, the yard foreman, as representing the workmen, also said a few words expressing their regret at Mr. English's departure, but their pleasure at his advancement. In reply, Mr. English asked the donors to accept his heartfelt thanks for their very useful present. He said it was a great pleasure to him to reflect upon the kind thoughts they all must have entertained towards him, and which had prompted such a gift.

ESSAYS AND REVIEWS.

GAS FOR HOUSE HEATING IN AMERICA.

In "Cassier's Magazine" for this month, Mr. Walton Forstall appears as the contributor of an interesting article on the above subject. It is interesting because it sets the question before us as viewed from an American standpoint; and Mr. Forstall, as the Assistant Distributing Engineer of the United Gas Improvement Company, is in a position to take a very comprehensive survey. Whether all that is stated in the contribution would be subscribed to generally by our American gas friends is another matter. It may, however, at once be asserted that it is not an article that inspires the belief that it will do anything towards improving the chances of the adoption of gas-fires; in the hands of the public, it would, we are inclined to fear, have rather a deterring effect. If Mr. Forstall will excuse us saying so, for a popular article on the subject he has made too much of the question of price, and has not sufficiently emphasized the conveniences of gas-fires (more particularly for intermittent use), and the savings that can be effected by the lighting of the fires only when wanted, their regulation to merely keep an apartment at an equable and comfortable temperature, and their immediate discontinuance when an apartment is not in use, as compared with constantly burning coal fires, and the trouble, labour, and expense attaching to their maintenance. It is not overlooked that "Cassier's Magazine" is devoted to the engineering industry; but many engineers who are not gas men know just about as much of the question of gas heating as "the man in the street." Therefore to state that 1000 cubic feet of gas, burned under theoretical conditions, will develop so many heat units and a ton of coal so many, that several thousands of cubic feet of gas are required to equal a ton of coal, and therefore with dollar gas, gas heating is so many more times the cost of heating by coal is putting a weapon into outsiders' hands which may be used to the disadvantage of the gas industry of America. Such statements might apply if the conditions of use were on an absolute equality, but if we may judge from experiences in this country, they are not; and recognition of this should have been accorded, through some practical comparison, the same prominence as Mr. Forstall gives to the question of cost computed on the heat-unit basis. Dollar gas, it may be mentioned, in case this review of the article falls into the hands of the uninformed, is certainly not common in this country.

Mr. Forstall engages attention by the first words of his article. During the time of the Pennsylvania coal strike last year, he tells us, thousands of householders in different parts of the United States, shut down their coal stoves and started gas-ranges; and thousands more bought gas-ranges as soon as their coal was used up, or when they realized the wisdom of husbanding that kind of fuel. For such, the coal strike had no terrors; and their number may be judged from the fact that, in one large city alone, 90,000 families—almost one out of every two on the line of the gas-mains—were cooking with gas long before winter set in; this representing a gain of nearly 40,000 gas-stoves since the strike began. In several of the large cities, judging by the enlarged sales of gas, the increase in stoves must have also been very great. Had the coal strike continued one month longer, gas would have meant to thousands their only salvation from starvation and cold; and the tremendous demand might have exceeded the manufacturing capacity available, as an increase of 100 per cent. over the preceding year was not unlikely. It would have been a very fine addition to the article, and, we venture to think, would have supplied a good comment on what follows as to the point of cost, if Mr. Forstall had given some idea as to whether, with and since the close of the coal strike, much of the benefit which grew out of this remarkable and unprecedented gain in gas cookers and fires has been lost to the gas suppliers, either by the return of the stoves or a decrease in the gas consumption.

However, in view of the increasing interest thus shown in the use of gas for heating, and considering also the general ignorance as to its cost compared with coal, and the conditions under which it may be used to the best advantage, Mr. Forstall supplies the following particulars, which, he says, "may be of value." "May be" suggests a doubt on the part of the writer; and we have grave doubts as to the value to the industry of their dissemination in a magazine not purely devoted to gas. Considering then the question of relative cost, and for simplicity adopting, as the heating value of artificial gas, the round figure of 700 British thermal units per cubic foot, he points out that 1000 cubic feet contain 700,000 heat units. Each pound of hard coal contains 12,500 heat units, and a net ton 25 million units. "Therefore, if all the heat contained in both kinds of fuel could be made effective in practice, 1000 cubic feet of gas would be worth in heat value only about 3 per cent. of a ton of coal, or, to express it in another way, 36,000 cubic feet of gas would be required to replace a ton of coal." Comparing the use of gas in flueless heaters with that of coal in a heating-stove, 100 per cent. efficiency may be allowed for the gas, and not more than 70 per cent. for the coal. If the coal is used in a hot-air furnace, not more than 50 per cent. of its heat is utilized. Therefore, in the first case, 25,000 cubic feet,

and in the second case 18,000 cubic feet of gas will replace one ton of coal. Upon these figures it is remarked that even if questions of health did not prevent the continuous use of flueless heaters, such use would be prohibited by the excessive expense. This expense is increased when gas is used with a flue connection, as only 70 per cent. of its heat is then realized under the best conditions.

In what follows, however, Mr. Forstall's American colleagues are given a modicum of comfort, and just a ray of light is thrown on to the fact that his ulterior intention is not to kill their gas-heating business outright. He says: Because of the saving through using gas only at the time when it is actually needed, experience has shown that, when gas is used in place of coal in a hot-air furnace, the results throughout several winters indicate that from 20,000 to 24,000 cubic feet of gas will replace a ton of coal. Therefore, if gas is taken at $1 per 1000 cubic feet and coal at $6 per net ton, the cost of gas heating would "not be more than four times than of coal," and, when the latter involves an expense for attendance, the ratio may be as high as three to one. This difference is wide enough to make gas out of the question for the great majority, for anything like continuous heating. But then Mr. Forstall points out that the conditions under which it may be used to advantage, as regards both economy and convenience, are in rooms with no other source of heat, and in which warmth in the coldest weather is required only for a few hours per day; or universally through a building during those days in early autumn or late spring when the room temperatures are in the fifties, and the necessary 10° or more of heat may be obtained by slight and intermittent use of gas. Such conditions of intermittent use are precisely similar to those ruling where gas is used for cooking, for which purpose $1 gas is found cheaper than $6 coal. Now this is the part of the article in which there is fair ground to complain of weakness if Mr. Forstall's essay is intended to be of advantage to the gas industry. These latter points require to be strongly emphasized and forced home by concrete examples and figures, and their genuineness proved. Mere *ipse dixit* assertion, without figures or illustration, will not have any great compensating effect against the costs statement previously submitted.

Mr. Forstall next enters into a short account of the development of heaters, and comments upon them with the view of showing the conditions under which gas may be employed to the best advantage. But there are few of the stoves which altogether commend themselves to him, until he comes to the end of his article, where he refers to house heating from one source by means of a hot-air furnace. This he does not criticize in any one respect—excepting that he finds the cost to be about "four times the amount of the coal bill." Running cursorily over his remarks, the reflector type of heater he admits gives a cheerful glow, at the expense of economy. The radiator (without it has a flue connection) is practically condemned on account of the vitiation of the atmosphere. Gas "fronts," gas logs, and gas grates are dealt with. With regard to them it is observed that the disposal of the products of combustion up the chimney makes these fires more expensive than the flueless heater; but the opportunity for room heating by gas, under the conditions previously defined as favourable, are numerous enough to warrant every householder in installing one or two fires. Their extra consumption, as compared with a flueless heater, is outweighed by their greater convenience, healthfulness, and safety. Mr. Forstall enters into an explanation of the phenomena of combustion as occurring in a luminous and in an atmospheric or blue flame; and before leaving this section of his subject, he expressed the opinion that "no gas-fire may hope to possess the charms of a coal or wood fire, but, on the score of readiness and cleanliness, the gas appliance leaves nothing to be desired. In hackneyed phrase, 'once tried, always used.'" Of course, the first part of this quotation is merely a declaration of personal opinion; and as to the "hackneyed phrase," it may be feared that, with the publication in America of a few more articles from such an exponent of gas heating as Mr. Forstall, the difficulty would eventually be to get people to make a trial.

Coming to the last part of this contribution, as is well known the only way in which gas has been used in America to any extent for house heating from one source has been in a hot-air furnace, made on lines similar to one used with coal, except in the construction of the combustion chamber, which is made higher and narrower. In his advocacy of these, Mr. Forstall states that, on the score of convenience, a gas-furnace may not be excelled by any coal-consuming device. A thermostat can be made to automatically maintain the temperature at any desired point, shutting off the gas supply as the temperature goes above, and turning it on again as it goes below, the standard. Thus, with such a furnace all the attention required is to light the pilot light on the first cold day in autumn, and put it out when summer has come to stay. Between these two days, the furnace will care for itself; and the house will always be just right—never too hot nor too cold. No cellar room need be provided for coal, and no dirt experienced from coal or ashes. The cost of heating by such a furnace with dollar gas will be about "four times the coal bill;" but there are probably many people who would not hesitate to spend the extra money if they fully appreciated the cleanliness and convenience afforded by gas in this way. The ratio of four to one just given is, as stated before by the author, reduced to less than three to one where the use of coal involves a special charge for attendance.

It is gratifying to observe, in his final remarks, that Mr. Forstall is of opinion that the use of gas for heating purposes is destined to increase largely even at present prices; and this increase will be very rapid. This, however, is a sanguine statement after what precedes it; and it is impossible to compliment Mr. Forstall on his conception—if this article portrays it—of the best means of realizing a rapid development. We are not in favour, nor is it our own practice, of getting business under false pretences; but it is fair, in the interests of business, to make the most of, and put in the forefront, proved advantages. That is what Mr. Forstall has not done. The article is illustrated by means of eight designs of stoves; and if these are fairly representative of the best that our American friends can produce, we advise them (excepting here the hot-air furnace) to study the catalogues of the British gas-fire makers. They may find some benefit from the exercise.

A VIEW OF THE GERMAN COKE TRADE.

PART of the Board of Trade Blue-Book on British and Foreign Trade and Industry, to which reference has already been made n these columns, is devoted to a consideration, by Mr. Schloss, of the question whether or not it is a feature of the Trust system of manufacture in the principal foreign countries to export goods at prices lower than those ruling at home. The question arises in connection with what it has become usual to term the "dumping policy" of getting rid of superfluous produce. It is assumed that this is a practice peculiar to organized or federated producers; but the assumption does not agree with general commercial experience. It has always been the practice of traders to make their prices to suit their customers; and the idea of a "one price" commerce is the exception to this rule. If it is once granted that dealers in a certain commodity can and do vary their prices at will, the question of whether or not this system of trading takes the particular form of "dumping" becomes a detail. Producers of commodities which are liable at any time to be a drug on the market always did and always will take their own course for relieving the glut. The example of gas undertakings and their coke sales at home and abroad is in point. There are two ways of disposing of a surplus of coke, the choice between them depending on circumstances. One way, and the preferable method, is to reduce the yard price to such a figure as will ensure a clearance; but this expedient is only available where there is a local trade ample enough for the purpose. Where there is no such trade, there is nothing for it but "dumping" the coke elsewhere for anything it will fetch, which must necessarily be less than the home prices. No combination of producers is requisite to initiate such a system of trading. The only sense in which anything on this account is chargeable to associated traders is as to whether such combinations increase the dumping. The Blue-Book contains some information on this point, as illustrated by the proceedings of the Westphalian Coke Kartell.

It appears that this association of coke manufacturers exports nearly 25 per cent. of the total production, at prices which rule lower than those charged in the home trade; but the difference has never yet been great, to say nothing about being unfair. Where the home consumer is at a disadvantage in this traffic is that the best and hardest coke goes abroad because of the necessity for complying with the conditions as to percentages of ash and dust—thus leaving the home consumer to make the best of what he can get. The foreign trade of the Westphalian Coke Kartell is chiefly with France, Austria, Belgium, Switzerland, and America. The exportation of German coke across the Atlantic grew from 39,268 metric tons in 1900 to 183,895 tons in 1902. This is a very remarkable state of things to have arisen, which British manufacturers should make it their business to look into. One of the results of the Kartell system that appears very early in the course of the inquiry is the extent to which the various combinations play into each other's hands. Thus the coke Kartell has been in the habit of fostering the export trade, not only by sending coke abroad at a lower price than that obtained in the home market, but also by allowing the substantial bounty of 1·50 marks per ton to blast-furnace owners making pig iron for export. This export trade could only be done at very cut prices. The competition in the rolled tube branch was keen, and "to meet the attacks of American makers, especially makers of gas-pipes, prices entailing a loss had to be accepted." In 1902, the Rhenish-Westphalian Coal Syndicate, in connection with the Westphalian Coal Syndicate, the Westphalian Coke Syndicate, and the respective syndicates of the pig iron, the half-finished iron and steel, and the girder industries, established a clearing-house at Düsseldorf, with the special object of dealing with premiums on export. Other manufacturers followed suit. The effects of this arrangement are manifold, some of them not advantageous to German trade. But the whole commerce is so cut-and-dried that the administrations of the various Kartells can make whatever prices they deem expedient. As H.M. Consul-General at Hamburg explains the operation, the price of iron plates in the Tyne may be £5 per ton, and the freight to Hamburg 5s. in addition. This makes the price of English plates in Hamburg £5 5s. per ton; and the Kartell price for German plates on the spot would be 2s. or 3s. per ton lower, in order to keep out the British goods. At the same time the

Kartell would be offering plates in the Tyne at about 1s. under the British quotation. "Thus the British shipbuilder on the Tyne can buy German plates at a lower price than the German shipbuilder in Germany itself, and at a lower price also than asked for British plates; while the German shipbuilder, though paying a higher price than the British shipbuilder, is always able to obtain German plates in Germany at a lower price than British." The difference is slight in this case, because there is no German import duty on plates for the time being; but when the tariff is extended to these goods, the case will be altered, and the Kartell will have matters all its own way.

The Kartell is the last successor in a line of trade syndicates, from which it differs chiefly in the fact of not having yet broken down. So far back as 1878, attempts were made to organize and regulate the gas coal trade in Westphalia, which answered fairly well, and lasted for a number of years. Temporary combinations for the restriction of output were also formed in 1880, 1881, 1885, and 1886. The present Syndicate dates from 1893. Its professed object is to secure for the firms belonging to it prices that will yield a profit, while still being moderate, and to regulate sales on a uniform basis, avoiding great fluctuations. The Syndicate works through a joint-stock company, having headquarters at Essen, who buy all the coal of the constituent mines, and undertake to sell it on specified conditions. The Company also buy and sell other coal. The entire capital of the Syndicate belongs to the owners in the combination, and the profits go back to the mines. Coke and briquettes are sold through the Westphalian Coke Syndicate, at Bochum, and the Briquette Sale Union at Dortmund. The Coal Syndicate is also interested in a transport Company who deal with traffic on the Dortmund and Ems Canal. The working of these combinations has a mixed reputation among traders. It seems to be acknowledged that the Syndicates have prevented the ruin of the smaller and the less favourably situated properties. The total output of the associated collieries is about 62 million tons.

For the purposes of the Kartell, the markets are classified into monopoly and non-monopoly districts. In Hamburg, the price of English coal, which predominates, rules the quotations. In monopoly markets, the price appears to be whatever can be obtained. In the others there is usually a fixed price. The Syndicate has stopped wasteful competition and districted the traders. It also encourages the formation of co-operative retail societies, to avoid competition among dealers. It is a leading idea of the Syndicate to maintain prices as nearly at a uniform level as possible, with which object they favour long contracts. The coal companies' dividends since the formation of the Syndicate have been more uniform and generally higher. The influence of the Syndicate on prices has been of a steadying character, and the temptation to secure inflation prices has been resisted. In 1899 and 1900, prices rose much higher in places where there was no coal syndicate.

The Upper Silesian Coal Convention differs from the Westphalian combination in not dealing with sales. It is merely an agreement as to production and prices, and does not touch coke. The chief competition is with English fuel on the Baltic and North Sea coasts. Here again the influence of combination has been to steady the trade and prevent violent fluctuations in prices. As regards the operations of the Westphalian Coke Kartell, it is declared that in 1899-1900, when coke was selling in Newcastle up to 35s., the Kartell might have undersold in the English market with German coke, but declined to do so. They kept the German coke for the German pig-iron trade, which needed it. It is a significant fact that in 1900 there were 850 tons of German hard coke exported to England; and in 1902 the figures had grown to 2346 tons. This is a small quantity as yet; but that any coke at all should take this road is remarkable. The Coke Kartell undertakes for the Coal Syndicate the sale of coking coal as well, to certain German firms and to the Belgian Coke Syndicate. The Coke Kartell is a Company with a capital of £20,000, all held by coke makers, and non-transferable. It claims that since its formation it has kept coke prices much steadier. In 1889, these prices jumped from 9·50 to 25 marks. The Syndicate only raised the price 3 marks—from 14 to 17 marks—in 1900. On the other hand, contracts renewable in 1900 were entered into for two years forward at the then price. Evidently consumers cannot have it both ways. Complaints are made of the quality of the coke sold by the Kartell; but the large sales of this product in the French and other markets should be sufficient evidence that the fuel is good enough for its purpose.

GAS ACTS FOR 1903.

(*Concluded from p. 797.*)

THE Scarborough Gas Act authorizes the raising of £75,000 of additional capital, to bear a 5 per cent. dividend, with one-third loan. An alteration is made in the matter of Auditors. The Auditors of the Company in office at the next ordinary meeting after the passing of the Act go out at that meeting; and at that and every subsequent meeting the Company are to appoint one Auditor in such manner as is provided for the election of Directors. An Auditor of the Company must be a member of the Institute of Chartered Accountants or of the Incorporated Society of Accountants, but he need not be a shareholder. He is not to hold any office in the Company nor be in any other manner interested in its concerns unless as a shareholder, mortgagee, or debenture holder. The Directors are to deliver to the Auditor the yearly account's and balance-sheet fourteen days at least before the meetings.

The Sittingbourne District Gas Act authorizes the raising of £50,000 of additional capital, of which not more than one-half may be 5 per cent. preference stock. Borrowing powers are in the proportion of one-fourth. Compulsory land powers are conferred. The maximum price of gas is 5s. per 1000 cubic feet. It is enacted that "any enrichment or increase of the illuminating power of the gas supplied by the Company effected otherwise than by coal or cannel shall be effected before the gas passes into the gasholder." The gas is to be tested within 600 yards of the Sittingbourne Town Hall. After the next ordinary meeting of the Company subsequent to the passing of the Act, at least one of the Auditors is to be a member of the Institute of Chartered Accountants or the Incorporated Society of Accountants. Consumers' fittings may be specified. Consumers' discounts up to 10 per cent. are allowable. The Company may supply gas in bulk outside the limits.

The Walker and Wallsend Union Gas Act converts the Company's already consolidated 7 per cent. stock into 3½ per cent. stock. The amount of the authorized insurance fund is not increased. Additional capital to the extent of £120,000 is authorized to be raised as 5 per cent. stock, not more than one-half to be in the form of preference stock. Unsold stock may be offered to consumers and employees of the Company at a discount on the reserve price of not exceeding 5 per cent. The borrowing powers are in the proportion of one-third. The standard price of 14-candle gas is 3s. 2d. In making tests for illuminating power, the gas is to be burnt at such rate as to yield the maximum light for which the burner is designed. Gratis flat-flame burners are to be supplied if required within two years. Consumers' fittings may be specified. Consumers' discounts up to 25 per cent. are allowable.

The Winchester Water and Gas Act converts the share capital of the Company into consolidated 5 per cent. stock, with the addition of £75,000, whereof not more than £30,000 is to be preference capital. Unsold stock may be offered to existing shareholders, consumers, or employees, with no special arrangement as to discount. The borrowing powers are one-third of the nominal amount of the consolidated stock. The gas limits are enlarged. Pipes may be laid for ancillary purposes. Clauses are inserted for the protection of the Hampshire County Council. Twenty-four hours' notice must be given of meter connections or disconnections. A clause relates to the recovery of penalties summarily.

The Birmingham Corporation Act contains a part relating to gas. The Corporation are empowered to light private streets and yards, by consent of the owners. Mains may be laid in undedicated roads. Section 15 of the Gas-Works Clauses Act, 1871, is amended by the substitution of the word "person" for that of "consumer" in the first line. A general interest fund is to be formed, for paying the interest accruing on the Corporation loans. Money realized on capital account from the sale of land or other disposition of Corporation property is to go to the sinking fund. The purchase by the Corporation of gas annuities by agreement is sanctioned. Money may be raised by the issue of bills of not less than £500, nor exceeding £500,000 in amount, not payable to bearer. Nothing in the Act is to prejudicially affect the holders of gas annuities. Certain provisions of the Birmingham Corporation Gas Act, 1875, stand unrepealed.

The Bradford Corporation Act contains a part relating to gas. The Corporation purchase for £31,000 the portion of the gas undertaking of the Shipley Urban District Council within the city. Also the Shipley Council buy from the Corporation for £800 the portion of the Corporation's undertaking which lies within the district of the Council. The Corporation are empowered to specify consumer's fittings—the railway companies excepted. Additional gas lands are required, and the necessary money for this purpose and for the purchase of the Shipley undertaking is to be repaid in thirty years.

The Chard Corporation Gas Act authorizes the Corporation to purchase the undertaking of the Gas Company, who obtained an Act in 1902 providing for this eventuality. The limits of the Act are the borough and parish of Chard. Plant outside the borough may be sold to the Local Authority at six months' notice. The method of transferring the property is duly prescribed. The Company are to be paid the taxed costs of obtaining their Act of 1902, and the winding-up expenses, including compensation to displaced officers and servants. The maximum price of 14-candle gas is 5s. per 1000 cubic feet, under the Gas-Works Clauses Act (1871) test. Consumers' fittings may be specified. The purchase-money is to be repaid in thirty years, and the loan for paying off the mortgages in forty years. Surplus profits on the working of the undertaking are payable to the district fund; and any shortage of revenue is to be charged to the district rate next made after the deficiency is ascertained.

The Leigh Corporation Act authorizes the laying of mains in undedicated roads. An accident fund may be created to the amount of £10,000, to meet claims on the Corporation under the Employers' Liability or Workmen's Compensation Act.

The Nantwich Urban District Council Act empowers the Urban District Council to acquire the undertaking of the Nantwich Gas Company, Limited, which has a share capital of £17,000 and a mortgage debt of £7000. In addition to the price of the undertaking, the District Council are to pay to the Company £250 towards the cost of promoting the Nantwich Gas Bill, 1903, of the opposition of the Company to this Act, and of winding-up. The Company's officers and servants are to be compensated. The maximum price of gas is 5s. per 1000 cubic feet, and the quality 15 candles, tested at the gas-works or the Council offices. Outlying portions of the undertaking may be sold to the sanitary authorities. The gas loan is to be repaid in forty years.

The New Hunstanton Improvement Act contains one part relating to gas. It defines the district of supply as including Hunstanton, Great Ringstead, and Heacham, in Norfolk. The ordinary clauses of the Model Bill are applied to the Council. Further expenditure has increased the cost of the gas-works purchased under an Act of 1897 by £627, which is to be borrowed, as well as additional gas capital to the amount of £17,000, repayable in forty years.

The Rickmansworth Gas Act transfers the property and rights of the Company to the District Council. The Act is to be set in operation within three months. In ascertaining the amount of purchase-money payable to the Company, an allowance of 10 per cent. is to be made for compulsory purchase; but no regard is to be paid to the obtaining by the Company of their Act of 1902, the actual costs of which and of the winding-up are to be paid by the Council. The present Secretary and Manager of the Company is to be compensated for loss of office or diminution of emolument. If the purchase-money is not paid within five months after the determination of the amount, the Company may declare the sale cancelled—receiving all their expenses. Pipes may be laid for ancillary purposes. The maximum price of 14-candle gas in the district is to be 4s. 7d. per 1000 cubic feet, and 5s. beyond. Consumers' fittings may be specified. Outlying portions of the undertaking are saleable to the local authorities. The gas loan is repayable in thirty years.

The Shepshed Urban District Council Gas Act provides for the transfer of the undertaking of the Shepshed Gas and Coke Company, Limited, to the Shepshed Urban District Council. For the purpose of determining the price or consideration to be paid to the Company for their property, the sale is to be treated as compulsory, and the Company regarded as having statutory powers similar to those conferred on the Council by the Act. For the same purpose, the original capital of the Company is taken at £5825; and they are deemed to have power to raise more money in the ordinary way. In addition to the value of the property transferred, the Company are also to receive the costs and expenses properly incurred prior to Dec. 20, 1902, in promoting a Provisional Order, together with the expenses of opposing the Bill for the present Act, and the costs of winding-up. The sum of £75 is to be paid as compensation to the Chairman and Secretary of the Company. Clauses are inserted for the protection of the Loughborough Corporation. The maximum price of 14-candle gas is 5s. per 1000 cubic feet; and the test is by the "London" argand burner No. 1, with a 6-inch chimney—the gas being burnt at such rate as to yield the maximum light for which the burner is designed. Consumers' discounts not exceeding 10 per cent. for prompt payment, or 20 per cent. for large consumption, are allowable. Consumers' fittings may be specified. The gas capital is repayable in forty years.

ELECTRIC LIGHTING MEMORANDA.

An Emergency and a Remedy—Free Wiring and Free Gas-Fittings—The Marylebone Deadlock—Surcharging at Shoreditch.

It is incumbent upon the managers of gas undertakings all over the country to address themselves seriously to meeting the new emergency for their business created by the general adoption by the electric lighting interest of free wiring in some form. This is done in different ways in various places, chiefly because there is still much reluctance on the part of local authorities to take the bull by the horns; but they are certain to do it sooner or later, with or without statutory powers. The truth of the matter is that the companies do it, and it will be impossible for the local authorities to refrain from following their example. Clearly, any slackness on the part of the latter in this regard would be incompatible with their claim to serve the public better than companies do. For if an electric lighting company offer free services, free meters, and free wiring, fittings, and electric lamps—as many of them already do—what can a neighbouring local authority engaged in the same business do but follow suit? It has not been altogether of their own good-will that even the companies have made this notable advance; but they have simply found themselves compelled to do it in order to get anything like a connection. And, after all, it is as well to lay out capital in this work as in running mains here, there, and everywhere in search of custom. Far better, from the point of view of the suppliers, to pick up trade from as many as possible of the houses past which the mains are laid, than to go afield. Yet the law under which most local authorities work permits of their keeping an open capital account for the latter extravagant purpose, while not sanctioning the former reasonable way of securing trade.

The electric lighting companies in suburban and provincial districts have learnt by painful experience that they must at all hazards put their light into houses, or else die. The speculative builders are beginning to help the cause forward, because they find that "wired for electric light" is as useful a bait for tenants as "gas and water laid on" used to be. They will not both wire and pipe their "eligible villa residences," so that gas for lighting purposes will be placed at the same disadvantage that electricity has hither suffered. It is impossible to overrate the importance of this state of affairs to the gas industry. In many places—as in the model dwellings put up by local authorities, and in residential flats—the most that gas can do is the cooking and some of the heating. This, however, will be a trade big enough to satisfy the gas companies, if they only look after it properly, and betimes. When householders once take to gas-cooking and gas-fires, assuming that the work is well done, they never go back upon these conveniences of town life; and they burn more gas in this way than they ever did for lighting. Not, of course, that the lighting branch is to be neglected—far from it, indeed; but nothing short of the most complete and thorough system of incandescent burner maintenance will suffice to keep this trade. And this, too, will have to be done gratis, at a push, even as the electricians are fain to do their wiring—perhaps to the extent of a free supply of mantles. Of course, it would be preferable to let the consumer go on doing these things himself, as he has done more or less in the past; but if he will not, it is better to serve him as he wishes than to lose him altogether.

Up to the time of writing, nothing has transpired to indicate the possibility of a solution being found for the Marylebone deadlock. In the borough, so far as any local public opinion can be ascertained, it is so strongly against the carrying out of the purchase scheme, that the Council are completely paralyzed. It is reported that a petition has been prepared for presentation to the Local Government Board, asking that consent to the completion of the transfer should be withheld, until a full investigation has been made into an allegation that certain members of the Council and the late Vestry used the knowledge acquired in their respective offices "for the purpose of facilitating speculative dealings in shares of the Metropolitan Company." It is difficult to see what there is in this somewhat vague charge to interfere with the order of the Court. Meanwhile, the November elections are approaching, and it is complained that the electric light business is so unpopular that neither of the political organizations by which candidates are usually accredited to the electors will touch it. Consequently, the ordinary system of providing candidates for the thankless office of Borough Councillor of Marylebone threatens to break down in this emergency, and leave retiring members with no successors. What is going to happen in this distressed Municipality nobody knows. If the ratepayers decline to carry on the local government institution of the district, who is to be answerable for the conduct of necessary public business? It is easy to say that the whole affair has been a stupendous blunder on the part of an incompetent Vestry; but that does not help to pay the piper or disclose any possible means of procuring the money.

Progressive local authorities do not love official auditors, for good and very sufficient reasons. "Surcharge" is a word of fear, unpleasing to the Progressive ear. There is a good deal of it in the air just now—more especially in the Metropolitan district. Consternation has been caused in Shoreditch by the action of the Government Auditor in surcharging, as already mentioned in the "Journal," fourteen of the borough councillors and aldermen, including the Mayor, the sum of £6198, the amount of the deficiency or loss incurred in the borough funds by reason of their neglect or refusal to make a rate of the amount necessary to balance the half-yearly accounts. It will be remembered that these councillors wanted the rates to look as light as possible, which they did by the simple expedient of refusing to make the rate advised by the Finance Committee, and carrying an amendment making it 2d. in the pound less. The question that has arisen is as to whether the Auditor has legal power to enforce in this way the levying of an adequate rate. The Metropolitan Local Authorities seem to be distinguishing themselves by originating conundrums for the higher authorities to answer. First Marylebone, next Shoreditch. It has arisen, too, over the same difficulty—municipal trading in electric light. Shoreditch is doing what the Marylebone Vestry wished to do; and the ratepayers are sorry for it. Wherefore the good, kind gentlemen who have got into the present trouble wanted to put a better face upon the borough finances than the facts warranted. It is a pity they did not have the fear of the Auditor a little more before their eyes.

American Gaslight Association.—The annual meeting of the Association will be held at Detroit (Mich.) from the 21st to the 23rd inst., under the presidency of Mr. Alten S. Miller, of Baltimore. In the general announcement recently issued by the Secretary (Mr. A. E. Forstall), the titles of only three papers are given: "Our Correspondence School," by Dr. A. C. Humphreys; "The Advantages of Enrichment," by Mr. A. G. Glasgow; and "Municipal Ownership," by Mr. H. L. Doherty. Other papers, however, are promised; but the authors have not yet decided upon the exact titles. In addition to the papers, there will be a lecture. The social functions will comprise a smoking concert, a banquet, and a steamboat excursion.

A DEVELOPMENT OF THE SIMMANCE-ABADY "FLICKER" PHOTOMETER.

THE principle or theory of the Simmance-Abady "Flicker" photometer has been so fully explained by special articles and occasional references in the "JOURNAL" that, in introducing what is at once a development and modification, presenting a wider range of utility than the original form, there is no necessity for entering into any elaborate explanation. But to sum up the points briefly for the information of those readers who have not given the matter particular consideration. Attention has been directed to the fact that the ordinary means of testing the illuminating power of lights have been defective in two particulars: (1) In testing lights of the same colour, there has always been scope for the personal error; and (2) in testing lights of different colours, it has been impossible to balance the lights with any certainty, owing to the different colour effects. Now the "Flicker" photometer has, it is believed, subdued these defects. It enables, as several observers have demonstrated, lights of the same colour or of different colours to be compared, and, in the improved form, we are assured, with preciseness and with entire freedom from all personal or other errors. The "extraordinary sharpness" with which such readings can be made, and the "good results" which can be obtained by the flicker method were, it may be remembered, testified to by Professor Lewes and Dr. Bunte at the sittings of the International Photometry Committee at Zurich in June.

The field of comparison in the new form of the photometer is a revolving screen, which is observed through an eye-piece. When

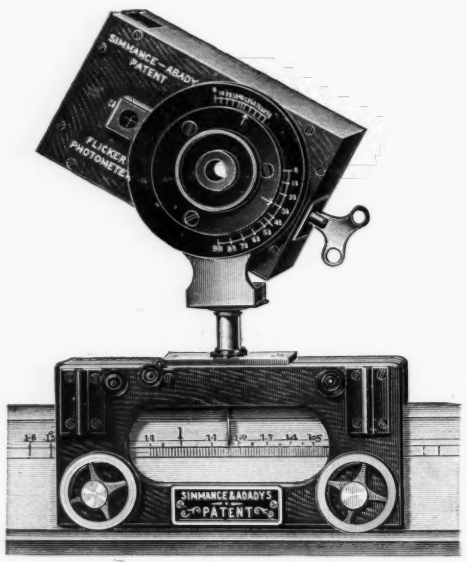


FIG. 1.

the lights are unequal, a "flickering" or throbbing effect is present; when they are equal, the flickering vanishes, and all the observer sees is an apparently motionless disc. Thus, it is claimed, the personal error is eliminated, as no one can mistake the difference between the disc when it is flickering and the disc when it is apparently still; and the phenomenon occurs however different in colour or in intensities the lights may be. Now a photometer which enables delicate tests and comparisons to be made of light-sources differing in colour appeals to the gas manager and photometrist in many ways, but in none more, at the present time, than in the determination of the illuminating power of incandescent gas-lights of high or low power, and the illuminating power of electric arcs and incandescent electric lamps. Before concluding this notice of the new development, it will be clearly seen how greatly it has widened the scope of investigation and the ascertaining of actual facts.

In the original arrangement (as was fully described in the articles published in the "JOURNAL" on April 21 last and June 9), the flicker-screen was used with the table form of photometer and the one-candle pentane standard. At the meeting of the Photometrical Committee, when Signor Böhm's paper on "A Method of Determining the Luminous Intensity of Incandescent Burners" was under discussion, Professor Lewes, calling attention to the original Simmance-Abady device, remarked that, on first using it, "he had noticed that the observations made with it of the illuminating power of mantles gave lower results than those made by practised observers on an ordinary photometer. The variations appeared in a large measure to be due to the one-candle standard used on the photometer; and he had come to the conclusion that the principle employed in that photometer should be applied to the bar photometer. Such an arrangement had now been carried out by Messrs. Simmance and Abady." This arrangement, as since perfected in several details, is the one which we now illustrate. Its principle is the same as that of the table form of the "Flicker" photometer, but—and this is the important point—*it is applicable to any existing photometer bar;* and, therefore, its serviceability and adoption have been made universal. Moreover, the whole arrangement is so compact and complete in itself that, when placed in its case after use (as it should be under any circumstances), both in size and appearance, it gives the impression of being nothing more than an ordinary hand camera, and so can be readily carried from place to place and used wherever there is a photometer of the bar type. Fig. 1 shows the new flicker disc-box, devised for testing both in the horizontal plane and at any angle. It is provided, as seen on the face of the box, with a "view-finder" and a revolving disc-box. By these means, the angle at which the light is placed can be quickly ascertained and fixed; and this enables both the light at an angle and the standard of light to be equalized under the law of inverse squares. Fig. 2 is a disc-box for horizontal testing only. In this new development, the electro-motor for obtaining the flickering movement has been discarded, and a simple spring motor has taken its place; and this is wound up by the key shown on the right-hand side of the disc-box. Some observers raised objections to the noise made by the oscillations in the first form as being somewhat distracting in making delicate tests; but this, in the arrangement now under notice, has been minimized to a degree that is quite unobjectionable. Means have also been provided for regulating the speed. Both the boxes—for simple horizontal and horizontal and angle testing—are made of a pattern ready for fixing to the saddle or carrier of the bar or scale of English, French, German, or American photometers. The sample sent for inspection was a beautiful piece of highly finished work; and we feel convinced that it will be an adjunct to the photometer room which will greatly enlarge the sphere of usefulness of photometric work and bring to the user an ever-increasing interest in research in this branch of his work. The final word upon it

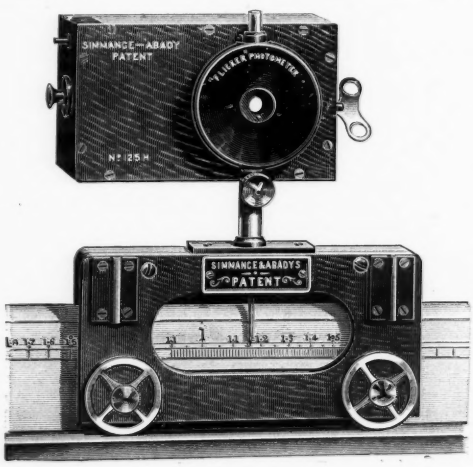


FIG. 2.

must, of course, be left to the experience with it of those who will have it under daily observation.

However, the operation of the new device will be further elucidated by a reference to the "instructions" which the inventors will issue with it. After seeing that the lights are in line with the bar, the "Flicker" photometer is placed on the bar, the spring motor wound up and the starting lever moved. To understand the principle of the photometer, it should be moved along the bar from end to end, keeping the eye (one only) fixed on the illuminated disc. It will be seen that the flicker stops at one point, and recommences as the box passes that point. That point is the balance of intensity. When making a reading, the box must be moved to this point of disappearance slowly and carefully, as the true reading is only on one spot—even a millimetre either side of it will cause the flicker to re-appear. If it is found that the flicker has a long range of disappearance—that is, is not sensitive—the speed is too great, and should be lessened by the speed regulator. On the contrary, if the flicker does not disappear, then one or other of these conditions are responsible: The speed is too slow; the lights are altering; the reflecting-wheel is soiled; or the lights are out of alignment. The instrument, indeed, is so sensitive that exceedingly slight alterations of power are shown by the "flicker;" and therefore Messrs. Simmance and Abady claim that "in ordinary gas testing accuracy hitherto unattainable is possible, while all the difficulty with different tints of light is abolished."

What has been said applies, in part, to horizontal testing only. A few additional words of explanation will show the method of testing lights at an angle. What has to be done is first to move the disc-box and view-finder (fig. 1) until they are horizontal. Then the disc-box must be revolved until the light under test is visible, and the angle is read off on the lower quadrant. Supposing this is 45°,

then the box must be turned to 22½°—thus presenting the same angle to both lights. This is facilitated by the half-scale top quadrant. The angle must always be found by the view-finder, and then subdivided so as to treat both lights alike. After adjusting the angles, the box must not be moved again; but the standard light has to be altered on the secondary standard principle until equality is observed. By adjusting the speed-regulator, the screen will revolve in any position of the box.

With the illustrations and the explanation given here, read in conjunction with previous published accounts of the Simmance-Abady photometer, we think that the whole principle of this further development will be understood and its importance recognized. It is the practical outcome of the persistence with which the inventors have worked, without stint of time, to realize a perfect measurer of lights of various kinds, colours, and intensities by any standard of light, and which work received the encomiums it deserved at Zurich. To the praise then extended to Messrs. Simmance and Abady, we venture to think a larger circle of photometrists will, in the near future, be prepared to subscribe.

A HANDBOOK FOR WATER STUDENTS.

It will not, we think, be questioned that the success of a student in any branch of science or art will depend in large measure upon the thoroughness with which he has been grounded in first principles. It was for many years considered that anybody was competent to carry on an elementary school, as when the pupils left they could be "finished off" by someone possessing greater attainments. The consequence was that the masters of the higher branches of a subject had to perform the difficult task of making something of pupils inadequately prepared to profit by their teaching. Recognizing the immense value of sound elementary instruction, a well-known publishing firm some years ago enlisted the services of a number of the most eminent scientific men of the day in the preparation of a series of text-books which have been circulated all over the world; and the hope was indulged that the effect would be to change the old order of things by imparting a solid substratum of knowledge on which a student could build. Whatever good may then have been accomplished, the evil complained of unfortunately persists.

Certainly, the student of any subject should have nothing to unlearn; and therefore the greatest care should be taken with him in the early stages of his work. It was probably this view which impressed Messrs. Charles Griffin and Co., Limited, when they arranged to publish a little work on the subject of water supply prepared by Mr. Reginald E. Middleton. The author, whose name has of late years been frequently before our readers, more especially in connection with the Staines reservoirs scheme, of which he is Joint Engineer with Mr. Walter Hunter, thought there was room for a book, specially suitable for engineering students, setting forth the general scientific principles on which the subject is based, and serving as an introduction to the larger and more technical treatises; and this he has endeavoured to produce.*

In devising a scheme for the supply of water to a town, the preliminary thing to be done is to select a suitable source. This is the matter which first engages the author's attention. His observations are summarized in diagrammatic form, in which the original source of water—rainfall—is traced to the service-pipes of the consumers very much in the way that family succession is traced in a pedigree. In the next two chapters, the requirements as to quality and quantity are dealt with. Mr. Middleton emphasizes the importance of knowing the exact composition and history of a water; and the engineer, in his choice of a source, must, he says, be guided by both of these investigations. In testing the efficiency of a proposed source as regards quantity, the annual supply required should be calculated on the basis of 20 to 25 gallons per head per day, and allowance made for a probable increase in the population for about fifteen years in advance. The water having been obtained, the next step to be taken is the provision of storage for it. This subject is treated in the fourth chapter, which is amply illustrated. The student is first shown how to find the requisite capacity for his reservoir, and then how to choose a site for it and proceed with its construction. As the author's remarks on the latter subject apply to masonry as well as to earthwork dams, he passes on to consider the dimensions which the former must have in order to ensure stability and the strength of the foundations. The student will probably find this one of the hardest chapters in the book; but it is one which must be carefully conned over, if he wishes to become a water engineer. Purification next receives attention; the construction and cleansing of sand filters being concisely described. This subject is illustrated by two plates showing a plan and sections of sand washers and a plan of filter-beds.

The water being now ready for distribution, Mr. Middleton passes on to deal with the construction of service reservoirs; illustrating his remarks by means of a plan and two sections. Water-towers and stand-pipes are also touched upon. This leads him to the subject of the flow of water through pipes, the formulæ relating to which appear, he says, in the minds of many who have little time to devote to the study of mathematics, to have become "enveloped in a sort of mystery greater than that which surrounds most of the formulæ of practical utility." In his opinion, however, the fundamental theoretical formulæ present very little real difficulty, and this he endeavours to remove. The student will do well to follow his guidance in this intricate matter. The closing chapters are devoted to distributing systems, pumping machinery, and rainfall statistics; a plate being given showing a typical arrangement of distributing mains for a small town. In this connection, the author cites figures, taken from actual practice, showing the economy of operating pumping plant with ordinary coal gas compared with steam in small works. In the case of gas the annual cost is £220; whereas steam comes to £412.

It only remains to say that Mr. Middleton has produced a book which may be studied with profit by anyone desirous of becoming acquainted with "the conditions governing the selection of sources and the distribution of water." He has not only put into it the results of his own large experience as a Water Engineer, but has had the co-operation of his Assistant (Mr. M. Mawson, Assoc.M.Inst.C.E.) as well as of Mr. M. T. Ormsby, M.Inst.C.E.I., Demonstrator of Municipal Engineering at University College. The student who thoroughly masters its contents will have made a good start in preparing himself to profit by the instruction conveyed by the larger works on the subject with which it deals; and this was the author's intention.

* "Water Supply: A Student's Handbook on the Conditions Governing the Selection of Sources and the Distribution of Water." By Reginald E. Middleton, M.Inst.C.E., London: Charles Griffin and Co., Limited; 1903.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 55.)

The week just closed has been a noteworthy period on the Stock Exchange. It opened in a state of extreme anxiety and apprehension, which almost threatened at one time to develop into a panic. The feeling in the Consols Market was intense as prices continued to fall, until one record after another was broken; and on Tuesday the mark of 86⅞ was touched. The settlement was looked forward to with dismay; and when at length pay-day came and closed without the sound of the "rattlesnake" being heard, the feeling of relief was exuberant. From that moment forth an improvement set in; and the week terminated in comparative buoyancy. Other markets were necessarily affected by both phases; so that prices all round show, with very few exceptions, an advance upon the opening figures. In the Money Market, there was a considerable demand, the close of the quarter adding its requirements to the accommodation needed in the Stock Exchange. But when these were duly satisfied, the tension was relaxed, and rates closed quite easy. In the Gas Market, business was only of very moderate proportions; but even here the storm that was raging in the big departments was not unfelt. Prices in the earlier part of the week were low, and the few changes in quotation that were made were all in the downward direction. Later on, however, the market sympathized with the recovery felt elsewhere; and several issues either got back their losses or else improved upon their opening figures. In Gaslight and Coke stocks, the ordinary showed only a limited display of transactions, with a mark of 83½ on Monday. But by Friday it was up to 85, and the quotation next day advanced a point. The secured issues were similarly affected; the maximum and the preference changing hands on Saturday at much better prices, and each gaining a point in quotation. South Metropolitan was noticeably weak at first, and on Tuesday one bargain was done "specially" as low as 113—the quotation being three points down. But after mid-week, there was a sharp rebound, the lost points were recovered, and the concluding price was 117. There was only one bargain marked in Commercials—a transaction in the 4 per cent. at a very good figure. But for some reason or other the 3½ per cent. was lowered a point without business being marked in it. The Suburban and Provincial group was as quiet as usual; and there was no change in the London Market beyond a fractional gain *ex div.* in Shrewsbury. But on the Local Exchange, all the Sheffields were advanced a point. In the Continental Companies, business was almost entirely confined to Imperial, which had a nice advance from 197½ on Monday to 202 on Saturday—the quotation being limited to an advance of only 3 points. None of the remoter undertakings was conspicuous. In the Water Companies, business was at a very low ebb, and devoid of much interest. Here, also, depression characterized the earlier portion of the week, and recovery the latter portion. On balance, however, the losses were heavier than the gains; and most of the changes in quotation show the minus sign.

The daily operations were too nearly upon an uniform level to demand further detailed review. The changes were: On Monday, South Metropolitan and Commercial 3½ per cent. fell 1 each. West Middlesex Water fell 3. On Tuesday, South Metropolitan fell 2 more. On Wednesday, Southwark Water fell 10. South Metropolitan regained 2 on Thursday. In Water, East London rose 3, and Southwark 2½. On Friday, Imperial rose 2. In Water, Southwark gained 2½; but Chelsea preference lost 2. On Saturday, there was a rise of 1 in Gaslight ordinary, maximum, and preference, in South Metropolitan, and in Imperial. West Middlesex Water rose 2½.

OBITUARY.

GEORGE HELPS.

We regret to record the death on the 29th ult., at the Manor House, Westenhanger, Kent, from heart failure following an attack of pneumonia, of Mr. George Helps, who for 48 years was Secretary of the Bath Gas Company. It may be remembered that Mr. Helps relinquished this position in March, 1902, on reaching his 76th year. When he entered the Company's service in 1854, there were only 2000 or 3000 consumers, who used about 100 million cubic feet of gas per annum, for which they paid 4s. 6d. per 1000 cubic feet. When he left it, the number was 11,000, and the yearly consumption between 500 and 600 million cubic feet, for which the charge was 2s. 7d., or only 3d. more than the lowest selling price reached. The Directors' appreciation of his services was shown by the granting to him of a retiring pension and the presentation of a handsome piece of plate. During his conduct of the secretarial work, Mr. Helps won the good-will and esteem of all who were associated with him. This feeling was given expression to at a gathering of the officers and workmen of the Company and a number of relatives and friends, which took place at the works on March 21, 1902, under the presidency of the Chief Engineer (Mr. C. Stafford Ellery), when he was presented with a gold watch, bearing a suitable inscription, accompanied by the donors' best wishes for his good health and happiness in his retirement. Unfortunately, he did not live long to enjoy the leisure to which nearly half-a-century's responsible work might rightly have entitled him. He had been ill for six weeks; but the end came very suddenly and peacefully. The body was removed to Bath, where the interment took place last Friday, in Locksbrook Cemetery. In addition to the members of the family, the Gas Company were represented by Mr. S. Fox Andrews, a Director, and the following principal officials: Messrs. H. Shepherd (Secretary), C. Stafford Ellery (Engineer and Manager), C. E. Merchant (Chief Clerk), J. Bingley (Assistant Engineer), Lewis C. Mundy and J. G. B. Curtis (Auditors), and R. W. Waite (Accountant). The late Mr. Helps was one of the oldest Freemasons in the Bath district, and as far back as 1873 was W.M. of the Royal Sussex Lodge, several of the Past Masters of which attended the funeral. Mr. Helps has gone to his rest in the fulness of years, and at the close of a life of usefulness and integrity. He leaves behind him sons who will keep his name associated with the important industry with which he was so long and honourably connected. At a meeting of the Board of Directors of the Gas Company last Wednesday, a resolution expressing deep regret at the death of Mr. Helps, sincere sympathy with the bereaved relatives, and the high appreciation by the Board of the services he rendered to the Company, was unanimously carried.

PERSONAL.

The Directors of the Alliance and Dublin Consumers' Gas Company have appointed Mr. Francis T. Cotton Manager as well as Secretary of the Company.

Mr. Edward Rollings, of the Eastcroft Gas-Works, Nottingham, has been appointed Superintendent of the Rochester Gas-Works, in place of Mr. J. W. Mackay, who, as already announced, has gone to Calcutta as Assistant Engineer and Manager of the Oriental Gas Company.

It is with sincere regret we announce this week that the long connection—official and administrative—of Mr. John Birch Paddon with the Brighton and Hove Gas Company has ended; and more particularly is it a matter of sorrow that the cause is advancing years. For 43 years, Mr. Paddon has been identified with the Company in various positions of responsibility; and he is one of the few men in the gas industry who can tally with Sir George Livesey in having been successively, in connection with one Company, Engineer, General Manager, Director, and Chairman. In view of this record, it is needless to remark upon the confidence which the faithful work in the first position won for Mr. Paddon from Directors and shareholders alike, and how that confidence was retained and expanded, as is marked by the advance from time to time to the positions of higher responsibility. The passing years brought no abatement in this trust and esteem; and the shareholders will now learn of his retirement with unfeigned sorrow. To him perhaps more than any man is due the high state of efficiency of the concern, and the prominent position it enjoys in the gas industry. His severance, too, has called forth widespread and unqualified regret from his colleagues and the whole of the staff; and we are sure that it is only a testimony to the truth when we say that from the highest official of the Company to the most lowly workman in the employ of the Company who knew Mr. Paddon—from Mr. Joseph Cash and Mr. Ernest L. Burton through their respective staffs—the loss will be felt as a personal one. To the chairmanship, Mr. John Miles has been elected; and it is gratifying to learn that a name so honourably connected with the Company's success as that of the late Chairman is still to stand among those administering the affairs of the Company—Mr. Arthur M. Paddon, M.Inst.C.E., having been appointed to fill the vacancy on the Board caused by his father's resignation.

TECHNICAL RECORD.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Darlington.

The Fifty-Third Half-Yearly Meeting of the Association was held last Saturday, in one of the class-rooms in the Technical College at Darlington. When the members assembled, they found that very elaborate preparations had been made for their reception. Light refreshments were served in one of the rooms, while the passages and staircase were lined with flowering and foliage plants, more of which adorned the front of the platform in the meeting-place. Nor must the efforts of Mr. Hovey to illustrate his paper be overlooked in the matter of preparation. A very elaborate series of carefully drawn diagrams, each surmounted by a large photograph of a portion of the plant, covered the walls on three sides of the room. In addition, a lantern and screen were employed to show a long list of photographic slides, illustrative of the work at its various stages. Considering how thoroughly the preparations had been made, it would have been matter of regret had the attendance not been good. But upon this score there was, happily, ample room for gratification.

Welcome to the Town.

The chair was taken at noon by Mr. Frank P. Tarratt, of Darlington, the President for the year. The President introduced to the meeting

Alderman T. M. Barron, Chairman of the Gas Committee of the Darlington Corporation, who said it was a pleasure to him to address his friend Mr. Tarratt by the new name which the Association had done him the honour of conferring upon him, in his position as their President. He was there that day on behalf of the members of the Corporation of Darlington to extend a welcome to them to the town. They were all aware of the fact that their Association was founded on the best possible lines. He believed that its inception was protection; and that, in addition to this, one of its principal objects was the extending of the knowledge and the experience of all its members. They had, in their body, the advantage of the presence of gentlemen of vast experience, who had accumulated a store of knowledge which was absolutely invaluable; and he understood that one of the effects of the Association was that the younger members were enabled, by their gatherings, and by their association, to obtain the benefit of the ripe experience of their seniors. It stood to reason that it was one of those Associations to which everybody who was interested in the gas world must extend a cordial welcome in every place to which they might happen to come. They in Darlington had benefited much from the gas undertaking in the past, and intended to do so in the future. They all looked upon themselves as citizens of no mean city, because in Darlington the first epoch-making history of railways had its inception. That afternoon, at the gas-works, they would see a bridge which was absolutely one of the most classical spots in the world, from an engineering point of view, because it was designed and built by Stephenson, forming part of a bridge over which the first railway train, on Nov. 27, 1825, passed, on its first journey from Darlington to what was then Stockton. On that occasion, a man on a horse rode forward, with a red flag, to warn people from the level-crossings, or who might have, from curiosity, got on to the line. The members had come to Darlington that day; and probably their experience would have caused those who saw that first train start from the North Road Station to turn in their graves, were such a thing possible. They had probably come to Darlington in one of those "fliers," covering, possibly, 60 miles an hour. The time since 1825 had not been long; but the progress had been great, and they in Darlington always felt they had had something to do with the extension and improvement in railways, which now formed a network over the country, and which, commercially and politically, and in every sense, formed one of the greatest factors in the civilized world. It was to be regretted that they were to be in the town for only a short time. They in Darlington were always glad to see their friends from a distance. He could assure them that, if there had been time, they would have been able to arrange for them visiting some of the big engineering works in the town. They had their works which were associated with their own particular business, and with other branches, which had an important bearing upon all the great engineering works in the world. They had with them their friend Mr. Coates, of the Whessoe Foundry, who was busily engaged in erecting structures at gas-works. At the North Road Railway Station, they had engines being made of great power and great speed; they had works where battleships had their rams prepared for them, to do destruction with on the seas; and they also had, in the Cleveland Engineering and Bridge Building Company, Limited, a Company who were able to undertake the erection of immense structures like the Tyne Bridge at

Newcastle, and the bridge across the Zambesi, in Central Africa. In addition to this, they had a number of other industries, all of which would have opened their doors to them, had time permitted; and they had a beautiful surrounding country which he hoped they would have some chance of seeing. He would not detain them longer; but he must express the great gratification which he had in seeing Mr. Tarratt occupying the proud position which he did that day, and also his sense of the cordial and happy relations which subsisted between him and those with whom he was closely associated. In his position of Chairman of the Gas Committee for a considerable number of years, and as a member of the Committee for a longer time, he had had many opportunities of seeing the gentleman whom they had exalted to the position of President, and who had come into the very closest touch with the Committee in the carrying forward of their work—thereby enabling them to do a great public work in addition to the lighting of the town. They had been able to relieve the ratepayers, in their purses, to the extent of 11d. per pound. If the members were able to stay there at night, they would see that Mr. Tarratt had recently given his attention, in conjunction with the Borough Surveyor, to the lighting of the streets; and though they were over-topped by the big electric arc lamps, they still took people to see the streets which were lighted by gas, and pointed to them without fear, asking for a comparison which they knew would be in favour of gas. When electricity was first introduced into the town, he had the honour of being its wet-nurse. It got to be rather a big undertaking; and the Council, very wisely, on the suggestion of the Gas Committee, appointed a new Committee, with a new Chairman, to look after the infant. They were very glad to know it was walking comfortably now, and making a fairly good show; but they in the Gas Department had no sort of intention of sitting down and letting it "boss" over them. They were keeping themselves in touch with everything in the shape of improvement; and they had no anxiety as to the competition between gas and electricity. They hailed it as a colleague, and did not dread it as an opponent; and so long as they had the benefit of the experience of the gentlemen whom he saw around him that day, he did not think they had anything to fear. He hoped the visit of the Association to Darlington would be pleasant and instructive.

The PRESIDENT thanked Alderman Barron most heartily for the welcome he had accorded the Association to the town. When he informed his Committee that it was the wish of the Association that he should occupy the presidential chair, the Committee most cordially agreed; and they had since done everything in their power, as they had done before, to make things as smooth and comfortable for him as possible. Acknowledging that the Association were conferring an honour upon him, in electing him to the office, they on their part had done their very utmost to give the Association a hearty welcome to the town; and he only hoped that the programme they had before them might meet with their approval. He also thanked Alderman Barron for the kind words he had said of himself. He did not know that he altogether deserved them; but it had always been his desire to do the best he could for the gas undertaking.

NEW MEMBERS.

The following were admitted to the Association:—

Member.—Bell, W., Haltwhistle.

Associate Members.—M'Crae, J. P., Assistant, Gas-Works, Hexham; Fowler, J. F., Assistant, Distributing Department, Newcastle and Gateshead Gas Company; and Wells, W., of the same department.

APOLOGIES FOR ABSENCE.

The HON. SECRETARY (Mr. H. Lees, of Hexham) intimated that he had received apologies for absence from, among others, Mr. H. E. Jones, President of the Institution of Gas Engineers, Mr. Alfred Colson, of Leicester, Mr. D. Terrace, of Middlesbrough, and Mr. J. Holliday, of Hull. It was also, he said, expected that one of their Colonial friends—Mr. Chenery Suggate, of the Auckland Gas-Works, New Zealand—would have been present; but intimation had come at the last moment that he was unable to attend.

PROPOSED TECHNICAL CLASS IN NEWCASTLE.

The HON. SECRETARY said that a few days previously a letter from the Rutherford College, Newcastle, had been sent to him, asking if it could possibly be arranged for a class in "Gas Manufacture" to be held in that institution. In reply, he said he would be very glad to place any communication on the subject before the Association; and he had received the following letter in reply:—

Rutherford College, Newcastle-on-Tyne, Oct. 2, 1903.

Dear Sir,—We are very much obliged for your favour of the 26th of September, and had hoped to write you sooner; but the matter in question requires a good deal of consideration before attempting to formulate anything definite. Even now we can only speak in a somewhat general way, but should be glad if you would bring the following statement before the members of your Association at their meeting to-morrow.

The Council of the College would, with as little delay as possible, form a class in "Gas Manufacture" if a sufficient number of students were forthcoming. As to the minimum number for a class, we think there should be about ten. So far as the "Chemistry of Gas Manufacture" is concerned, the students would be under either Mr. George Smith, B.Sc., A.R.S.M., head of our Chemical Department, or Mr. J. G. Kettlewell, M.Sc. So far as the purely technical side of the work is concerned, we propose to engage a fully qualified person, engaged in, and possessing a practical knowledge of, the business of gas manufacture; and in the event of the class being formed, you may possibly be able to assist us to secure a suitable instructor.

With regard to fees, we propose something like 25s. for the session; but we trust that some of the local gas companies would see their way to contribute towards the cost of carrying on this work.

On hearing from you again, this matter will have our best attention.

Yours faithfully,

R. THOMSON.

The HON. SECRETARY said this question had been before the Committee that morning; and they had decided to ask the meeting to empower them to appoint a Sub-Committee to consider the subject, with power to act as they thought desirable. In view of this recommendation, he moved that the Committee of the Association be empowered to do as suggested.

Mr. J. HEPWORTH (Edinburgh) thought this was a very wise step to take; and they might be certain that the Committee who would have charge of the matter would do their best to make Newcastle a centre for technical training in the subject. It was a little out of date, he thought, because they ought to have had it sooner. They knew that in other centres very large numbers of students were availing themselves of the great advantages which such classes conferred upon them. He was glad that it was proposed there; and he cordially seconded the motion.

The PRESIDENT said he was fully in accord with the views expressed by Mr. Hepworth. If the classes were to be opened this session, the sooner the arrangements for it were made the better.

The motion was agreed to.

THE PRESIDENTIAL ADDRESS.

The PRESIDENT then delivered his address:—

Gentlemen,—In presenting my address to you, let me first thank you for the honour you have conferred in electing me as President of this Association during the current year, especially considering the short time that I have been in the North of England. I feel most keenly the responsibility that the duties of the office involve, when I call to mind the many able men who have preceded me in the Presidential Chair—many of whom have grown grey in serving their companies and corporations so ably—but trust that my remarks may prove of interest to those men of longer experience than my own.

One of the obligations of the office of President is to prepare a suitable address; and the difficulty in opening new ground becomes greater each year. Nevertheless, I hope that, with the assistance of the Hon. Secretary and the Committee, the high reputation of the Association may be fully maintained during my year of office.

In reviewing the many changes that have taken place in the ordinary routine of gas-works management during the past few years, I cannot help but say that I have been greatly impressed by the strenuous efforts that are being put forth each day to keep the gas industry in the forefront of competitors for the supply of artificial lighting and heating power to our large towns and cities. It is no longer only necessary to supply gas at a fair marketable price, and let customers come to us and order a supply to be laid on to their premises; we have to use every endeavour to find fresh outlets for our commodity, and encourage all to consume the gas to the greatest possible advantage to themselves. This can only be attained by placing before them the various methods to be adopted, if they are to secure these advantages. Otherwise the concerns of which we have charge must inevitably fall back, and various competitors will take the field in which we have so long held the foremost position.

Many companies and corporations at the present time are using every available means of offering to the general public at a reasonable price the most suitable type of burners, fittings, and heating and cooking appliances, from which the best results are likely to be obtained at a minimum of cost to themselves. It is quite certain that the results secured do give general satisfaction, and reward the suppliers of gas for the efforts made by them, and so fully justify the expense entailed in maintaining a public show-room, where the latest appliances can be seen, and where consumers obtain the advice of a person competent to assist them in selecting fittings most suited to their requirements.

The success that has attended the introduction of incandescent lighting has undoubtedly given us a new lease of life; and even in the humblest homes we find some form of incandescent burner in use. Ere long, I fully expect that it will be the exception to find a home that is not equipped with a gas heating or cooking stove of some description, as I think we have now almost outlived the prejudice that at one time undoubtedly existed against these clean and labour-saving appliances. Several most interesting articles have lately appeared in one of the leading London daily papers; and from the way in which the use of coal gas in our domestic dwellings and factories has been advocated as a help to the solution of the smoke abatement question, we can rest assured we have the powerful support of the Press on our side.

While we continue on the lookout for extending our supply, we must be constantly watchful that the commodity we deal in is offered at the lowest possible figure. To attain this, we must fall back on the first process in gas manufacture, and see if we are handling our raw materials in the most economical manner, and, if not, ascertain in what way we may improve upon existing methods. Many of us unfortunately are not in a position—owing to a variety of circumstances—to adopt the latest appliances for placing the coal into the retorts and removing the residual coke; but it behoves us to watch our opportunities for adopting any

new process applicable to our existing works, that will show a saving in the cost of production, and at the same time maintain a fair percentage of profit upon the extra capital employed, as we have now to face considerable competition—notwithstanding which, however, the majority of gas companies are to-day paying higher dividends than has been the case for many years.

The question of inclined *versus* horizontal retorts has been much discussed during the past few years; and we are now confronted with yet another method—that of carbonizing our coal in vertical retorts. What may be ultimately considered the best system to adopt, it is almost impossible to foretell; but we cannot do other than admire those men who have the pluck and confidence to venture on entirely new lines, and I trust that the results they obtain may be put forward in such a manner that we shall have some really reliable data to work upon, which will enable the gas profession to profit by their experience. When we consider that at many works the cost of carbonizing a ton of coal is as high as 3s. 3d., while at others it falls as low as 9¾d., we cannot fail to see that it is high time an attempt was made to improve our conditions of working. We have numerous examples of the inclined retort system; and for those engineers who still prefer horizontals, with machines—such as West's combined, the De Brouwer projector, the electric turbine charger and discharging ram, now in use at La Villette Station of the Paris Gas Company, and lastly the Fiddes-Aldridge combination retort charging and discharging machine—there is now quite a variety to select from. Until the last few years, it has never been considered advisable to adopt labour-saving appliances to any extent except in large-sized works; but the results lately obtained at several medium-sized works, have fully justified the engineers in adopting the various forms of machinery for handling both coal and coke.

One of the greatest competitors for heating and power, which form practically our day load, are the various producer gas systems—such as the Mond, Dowson, and other types of plant, which are now being erected in various parts of the country. Perhaps I need hardly look upon water power as a competitor, as this is only available to any extent in America, Switzerland, and Italy; and I do not feel disposed to deal with electrical power, as the cost of producing this was most ably set before you by my predecessor in the chair at last year's meeting. I consider the question of gas power concerns us most.

I have given serious consideration for some time to the generation of power, but more especially since the Mond gas schemes have been so prominently before us. In England, water power cannot be considered as a serious rival, as the source of supply is so very limited; and under the most favourable circumstances—taking as an example the Falls of Foyers and Niagara installations—from all the information I can gather, the actual cost cannot be taken as far short of £4 per brake horse power per annum. With large steam-power installations situated near the coalfields, I suppose it costs about the same figure; but these need hardly enter into our consideration. Gas-engines of the most modern type are guaranteed by their makers to consume from 14 to 18 cubic feet of ordinary coal gas, having a calorific value of 600 B.T.U., per brake horse power per hour; whereas the calorific value of Dellwik gas is only 290 B.T.U., and that of Mond gas 150 B.T.U. But it is claimed in some localities that this form of producer gas can be made for 2d. per 1000 cubic feet; and this is what I consider our most serious competitor. With the exception of the Mond and Duff processes, gas producers generally have to use either anthracite or a high-class coke, both of which in the first instance, as you are aware, are costly materials; and I do not think that they can enter into keen competition with us, except in isolated instances where distribution is not necessary.

Regarding the Mond process, which has come so rapidly to the front during the past few years, for very large installations this system will doubtless receive a very considerable amount of support. The net cost of the gas depends very largely on the price attainable for the residual ammonia recovered; and sulphate of ammonia at its present market value, forms an inducement to expend the very heavy outlay required to put down a plant of this description. Cheap bituminous slack can be used in these plants; and 1 ton of coal produces 90 lbs. of sulphate of ammonia and 160,000 cubic feet of gas of low value, averaging about 150 B.T.U. available for power purposes, about 80 cubic feet of which is required per brake horse power per hour. From this you will see we must considerably modify the prices generally charged for coal gas, when required for power purposes in large quantities—or to use the more popular term "taken in bulk"—if we are to compete with them, though it will doubtless have been observed that statutory powers to supply gas of this description have only been applied for up to the present time in specially suitable areas where power is required in very large quantities.

I have been much impressed by the great increase in the number of recovery coke ovens now in use all over the country, which must result in an enormous increase in the quantity of ammoniacal liquor and tar products put on the market; and it is rather surprising that the value of these residuals is still maintained. This suggests to me that in the near future it may be possible for gas-works situated in an iron-producing district, where there is a regular demand for hard coke, and where coal of suitable quality can be readily obtained, to adopt some such system of carbonization. This, however, is only applicable to works of such magnitude that they can insure the continuous working of a fair-sized unit of this description.

This aspect of the case was brought more prominently before my mind in a paper, entitled "Notes on Residuals," read by Mr. Charles Hunt before the Institution of Gas Engineers in 1896; and, as I have said, the advisability might be considered of a gas company erecting a section of their plant after this description. The gas produced could either be used for power purposes or easily enriched if deemed desirable; but at the present time, when the cry seems to be almost entirely on the side of low-grade gas, it may appear rather superfluous to suggest the question of enrichment. Perhaps this may form a solution of the difficulty of producing the low candle-power gas which some engineers suggest should be manufactured in the apparatus usually employed. Just lately I have had brought before my notice the case of a gas-works being dismantled, and the necessary supply of gas for the township being obtained from a neighbouring coke-oven plant; the consumers being supplied with the gas produced, after being enriched with benzol, which is also manufactured at the coking plant. The cost of carbonizing the coal in this manner is very low; and, as before stated, the sale of the bye-products is a source of considerable revenue.

Now perhaps I may deal with subjects relative to the undertaking of which I am at present in charge, as one always feels that he can at least fall back on his own experience in providing a subject which is likely to interest the majority of the members. The Darlington Gas-Works were acquired by the Local Board in 1854; and I presume it would be one of the earliest works to have passed into the hands of a Local Authority. The purchase price paid was £27,000. The gas made at that time was slightly over 13 million cubic feet per annum; whereas the quantity manufactured at the present time is 336 million cubic feet, and the capital outlay stands at £138,613. The rate of increase is seen from the following table, which shows clearly the growth of the undertaking since being in the hands of the community:—

TABLE I.—*Growth of the Darlington Gas Undertaking.*

Year Ending.	Gas Made. Cubic Feet.	Increase per Cent.	Total Number of Meters.	No. of Public Lamps.	Price of Gas per 1000.
Dec., 1854	13 million	..	640	..	5s. 0d.
,, 1864	29 ,,	123	1233	287	4 2
,, 1874	66 ,,	127	2840	530	3 8
,, 1884	147 ,,	122	3374	754	2 4
,, 1894	208 ,,	41	4492	904	2 0
Mar., 1903	336 ,,	61	8975	1010	2 1

The amount of profit that has been transferred in aid of the general district rate, dealing only with the past nine years, is £46,312; the actual sum handed over last year being £7467, equivalent to a rate of over 10d. in the pound. Perhaps the additional figures given in Table II. may prove of interest.

TABLE II.—*Financial Statistics.*

Year	Capital in Works.	Gross Income.	Gross Profit.	Per Cent. on Capital Employed.	Net Profit.	Per Cent. on Capital Employed.	Equivalent Rate in the Pound.
1898	£116,688	£34,094	£7,989	6·84	£5,990	5·13	9·45d.
1899	117,581	40,741	8,243	7·01	5,245	4·46	9·27
1900	117,395	51,933	11,073	9·43	8,858	7·54	12·90
1901	124,151	50,156	9,305	7·49	6,967	5·61	9·84
1902*	125,520	15,822	4,857	3·86	3,976	3·16	5·61
1903*	138,632	47,195	13,260	9·56	10,116	7·29	13·62

* The accounts are now made up to the 31st of March, so that 1902 only represents one-quarter of a year's working.

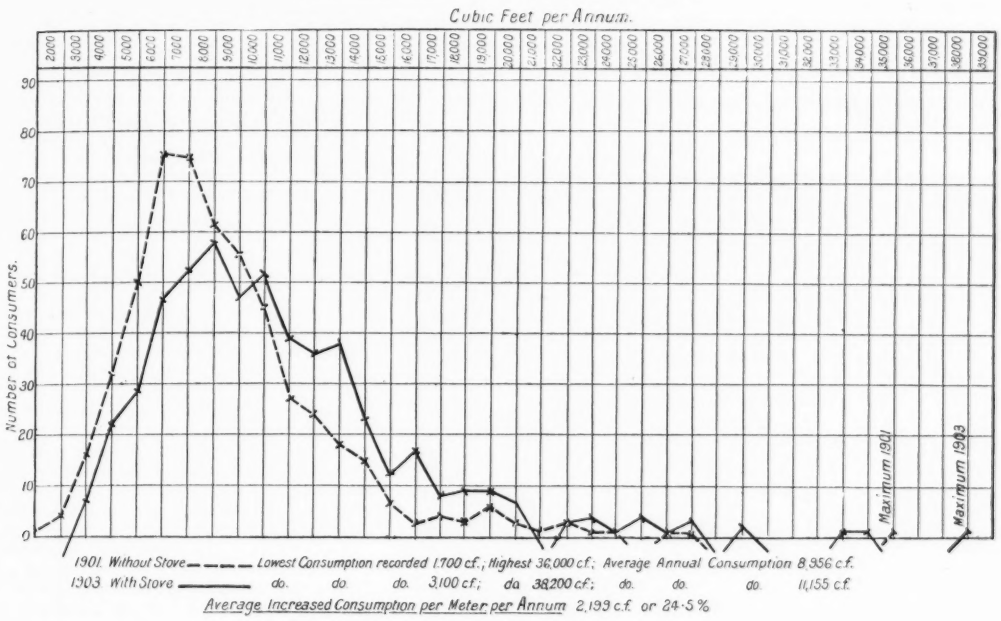
From this, you will see that the town is now receiving a considerable revenue from this undertaking, thus showing the wisdom and forethought displayed by the City Fathers in purchasing the concern at such an early period. Darlington might justly claim to be among the pioneers of municipalization. Doubtless many of you will not be in agreement with the policy adopted in handing over such large sums in aid of the rates; and I think we have now reached what may be termed the "high-water mark" in this direction.

Up till very recently, generally speaking, gas-works have been in the happy position of not being troubled with improvements of a revolutionary nature; and therefore the sinking-fund charges imposed upon us by the Government, together with the liberal allowance for repairs and renewals made annually out of revenue, have enabled us to keep the works in a thoroughly efficient state. But I am quite in agreement with the remarks made by Mr. Corbet Woodall some few weeks since, when he stated that gas-retorts were in a state of "instability," as at the present moment, with the many new systems before us, it is almost impossible to foretell with any degree of certainty what portions of our plant may in the very near future be rendered totally unsuitable for the economical production of coal gas. I trust that, with the help of my Committee, we shall now proceed to build up a substantial reserve fund, in order that we may cope with any great change in the methods of working that it might be found advisable to adopt, and also tide over temporary fluctuations in the price of our raw materials, instead of resorting to the present practice of continually changing our selling price. One aspect

TABLE III.

Diagram showing the Consumption by Slot Meters before and after fixing Stoves

[The Calculations are based upon 534 installations.]

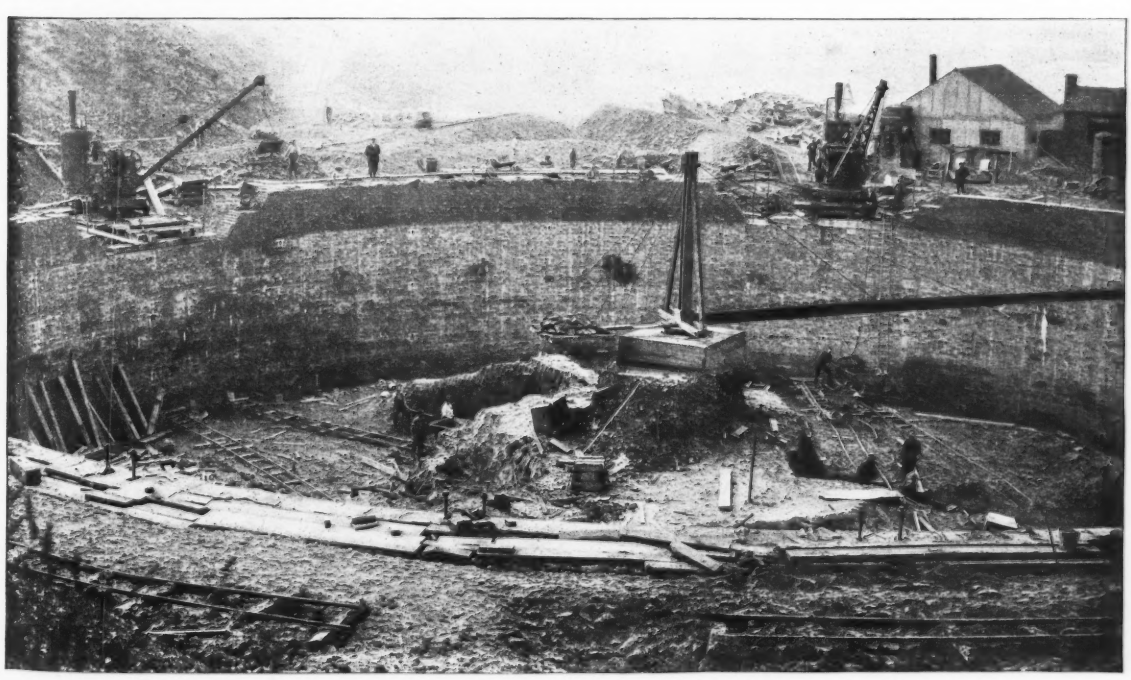

Cubic Feet per Annum.
Number of Consumers.
Maximum 1901
Maximum 1903
1901 Without Stove — — — Lowest Consumption recorded 1,700 c.f.; Highest 36,000 c.f.; Average Annual Consumption 8,956 c.f.
1903 With Stove ——— do. do. do. 3,100 c.f.; do. 38,200 c.f.; do. do. do. 11,155 c.f.
Average Increased Consumption per Meter per Annum 2,199 c.f. or 24·5 %

of this question has undoubtedly been brought more prominently before my notice owing to the urgent necessity for making considerable additions to our existing works, as there is every evidence of our rate of increase being more than maintained. I fully anticipate that, if the additional capital is judiciously expended, in adopting as far as possible the many labour-saving appliances that have been brought to our attention during the last two or three years, we shall save considerably more in the cost of production than will pay the increased interest and liquidation charges. This will enable us to maintain our present rate of profit, and still be in a position to supply gas at existing prices—viz., 2s. 1d. per 1000 cubic feet net for lighting, 1s. 10d. net for power purposes.

Not many gas undertakings have such a small capital account as that with which I am connected; but the present conditions of working are anything but comfortable—the plant being strained to the utmost to maintain an adequate supply during the four months of maximum demand. In mid-winter, my daily output exceeds 1½ million cubic feet, with a storage capacity of less than 1 million; but I hope next winter to be in a much safer position in this respect, as at the present time we are putting in a gasholder to contain 1½ million feet. You will have an opportunity later in the day of inspecting the tank, which is in course of construction.

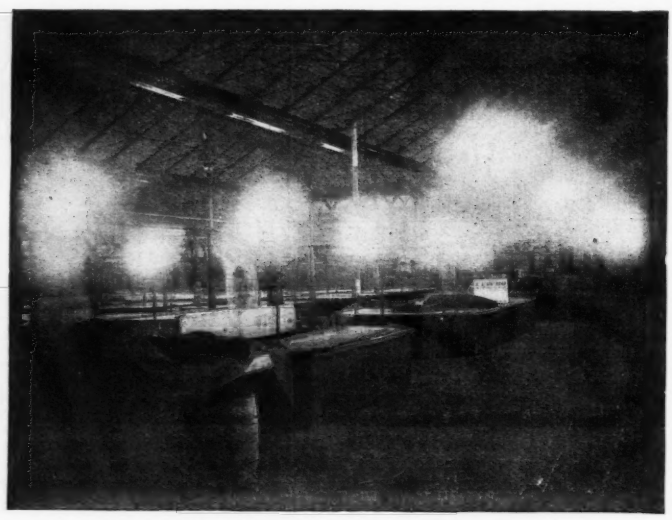
Since taking charge of the works in 1898, every endeavour has been made to popularize the use of gas for cooking, heating, and power purposes, with the result that our day consumption has shown a most satisfactory increase. The number of cookers out on ordinary hire has increased from 800 to 1350; and upwards of 2200 slot cookers have been fixed in connection with the automatic meter installations, over 3000 of which are in use at the present time. By this means, we have tapped an area that could hardly have been reached in any other way; and by judiciously fixing the price at a reasonable figure, we have possibly derived greater benefits than many concerns, as the capital outlay involved and the upkeep of these installations is undoubtedly heavy.

Table III. is a diagram showing the consumption of the slot meters before and after fixing stoves, in which I have endeavoured to bring before you the point of average consumption, and give an idea as to where the maximum demand stands. As will be



THE GASHOLDER TANK AT DARLINGTON UNDER CONSTRUCTION.

observed, the average consumption per automatic meter in our case does not justify a lower price than 3s. 4d. per 1000 cubic feet being charged. Possibly the working classes in this so-called Quaker Town are more frugal than those which some of you are called upon to supply. Our recent venture in furnishing a cooking-stove free of charge to all automatic consumers requiring same, has in its initial year of working resulted in an increased consumption per automatic meter of 24·5 per cent. This figure is somewhat lower than anticipated, but is more than accounted for by the exceptional climatic conditions we have experienced during the past summer.



The gas-engine consumption during the past five years has increased from 10 million to 23 million cubic feet per annum; and I am quite convinced that this form of motive power, which has been growing in importance for several years, has every promise of robbing the steam-engine of a large share of its laurels. The steam-engine of the present day is about as perfect as science and invention can make it; and there is apparently little hope for further improvement. But recent developments in gas-engine practice and in the use of fuel gas, have shown an efficiency for the combined producer and gas-engine, which is greatly superior to the results obtained in the latest types of steam boiler and engine; and the gas-engine is better adapted to deal with variations of load. At the same time, we must constantly watch that the price charged to this class of consumer does not cause us to be supplanted by users adopting some form of fuel gas or electricity. We must offer them every encouragement if we are to retain them, and by so doing we shall have nothing to fear from rivalry. As gas engineers, we should set an example by using the power that we have at our command for driving our exhausters and other machinery on the works, instead of employing steam, which is the general practice. By these means, we shall convince the outside public of the reliance that can be placed on a gas-engine, as I suppose there are few industries that are so dependent on their continuous working as a coal-gas plant.

TABLE IV.—*Comparison of Daily Output* 1899 *to* 1903.

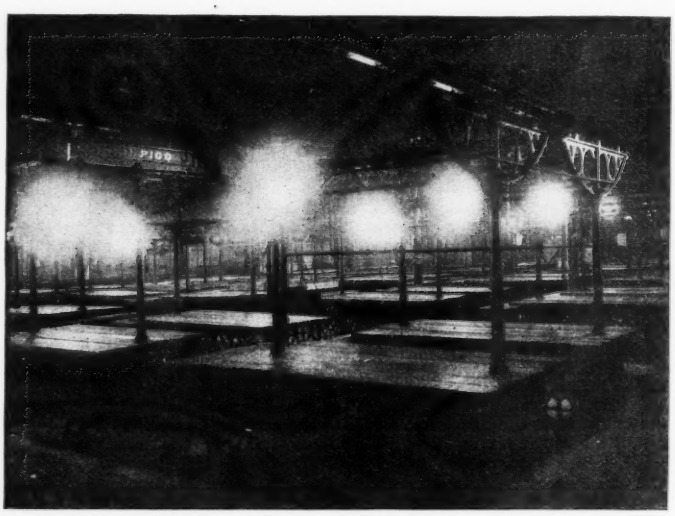
YEAR.	GAS DELIVERED FROM WORKS.		
Average of Five Days in June.	24 Hours.	12 Hours. (6 a.m. to 6 p.m.)	Proportion of Day Consumption to 24 Hours' Delivery.
	Cubic Feet.	Cubic Feet.	Per Cent.
1899	482,000	189,000	39·21
1900	530,000	226,000	42·64
1901	493,000	211,000	42·80
1902	598,000	272,000	45·49
1903	626,000	311,000	49·68

The above table shows clearly the extent to which our day consumption has increased since 1899; and I regret that I have not been able to find any figures relative to other undertakings with which I could compare them, but trust that those of you who have not gone into this aspect of the question will now be interested enough to look into the matter.

During last winter, it was decided to make an effort to improve the method of lighting the interior of the covered market in this town. Two schemes were submitted to the Markets and Fairs Committee—one by means of electric arc lamps, and the other by means of a high-pressure incandescent gas system, the latter of which, I am pleased to say, was adopted, and is now installed; and I trust some of the members present will take the opportunity of inspecting same this evening. The buildings are lighted by means of 48 2-light cluster burner lanterns, supplied from two No. 3 Keith compressors worked by water-motors. The total quantity of gas consumed per hour is 960 cubic feet, and the light obtained is equal to 32,000 candles, or 1·80 candles per super. foot of the floor area. The building was lighted previously by upwards of 300 flat-flame burners, consuming 2500 cubic feet per hour; and the probable light obtained would not exceed 6200 candles. I think the figures given in Table V. speak for themselves. It may be observed that the lighting value per superficial foot of the floor is somewhat high; but as some little difficulty was at first experienced in overcoming the shadows thrown upon the stalls, it was decided to increase the number of lamps, so that the light would be more evenly diffused throughout the building.

In the public streets, we have at the present time 657 flat-flame burner lanterns, 190 2-light incandescent, 155 single incandescent, and 40 electric arc lamps; and I am constantly receiving instructions to convert the flat-flame burners into the incandescent type, as the lighting by this method has met with the entire approval of the Street Lighting Committee. I do not think it likely that any additional arc lamps will now be erected, not only on account of the extra cost, but the general impression now being that the thoroughfares are more efficiently lighted by incandescent gas than where electricity has been adopted.

In conclusion, let me say how thoroughly I concur in the remarks of Mr. A. Dougall, the ex-President of the Institution of Gas Engineers, in expressing the hope that the earliest opportunity should be taken of affiliating the District Associations with the National Institution, now happily united once more; and I trust that the efforts of the Council of the Institution of Gas Engineers in that direction may be rewarded with success. When that is accomplished, the position of the gas industry will be still further strengthened, and we may look forward with confidence to retaining the foremost place as suppliers of light, and of constantly improving our position in regard to meeting the demand for heating and motive power.



THE KEITH LIGHTING IN THE DARLINGTON COVERED MARKET.

TABLE V.—*Comparison of the Cost of Lighting Darlington Covered Market.*

System Employed.	Total Consumption per Hour.	Total Illuminating Power.	Lighting Value per Super. Foot of Floor Area.	Total Cost per Hour.	Cost per 1000 Candles per Hour.
	Cubic Feet.	Sperm Candles		s. d.	d.
Flat-flame .	2,500	6,200	0·34	5 2½	10·08
Keith's High-Pressure .	960	32,000	1·08	2 6	00·94

Mr. W. Ford (Stockton) said the few words he had to say would be of a very congratulatory nature. They had in the President's chair a gentleman who had come among them in the North quite lately. He told them that he had some diffidence in putting forward some of his propositions; but he thought that, as in the characteristic words of Alderman Barron, they could only express similar confidence in their esteemed President, as he had told them that the people of Darlington, and the Gas Committee, which he more directly represented, valued his services so very highly. And he could assure their President that if the Darlington people appreciated his services, they, the older members of the Association, could assure him that they held out the right hand of fellowship to him in all his undertakings, and wished him long life, health, and happiness, and that he might prosper in the way he had done in the past until he arrived at the height of perfection in the profession in which he was now an ornament. He had therefore to ask them to accord to the President their warmest thanks for his able address.

Mr. T. H. Duxbury (South Shields) said he had very much pleasure in seconding the motion. He knew that several points had been given them by the President which would be certainly very useful to himself, and which he would have great pleasure in perusing when he got back to Shields.

The motion was put to the meeting by Mr. E. E. J. Anderson, of Middleton, the Vice-President, and agreed to.

The President thanked the meeting for the vote of thanks, and for the remarks which had been so kindly made by Mr. Ford and Mr. Duxbury. He was sure that what little he had been able to do for the Association had been a labour of love; and if at any time he could be of any assistance to the North of England Association, he would be always only too pleased to do anything in his power.

Extensions at the Tynemouth Gas-Works.

Mr. A. C. Hovey (North Shields) then read a paper on "Constructional Details and Costs of Recent Extensions, with Notes on Working Results, at the Tynemouth Gas-Works, North Shields." The paper, which was profusely illustrated by diagrams and lantern slides, will be found, with the discussion thereon, on pp. 33-44.

Vote of Thanks to the Corporation.

Mr. J. H. Penney (South Shields) thought they could not speak too highly of the kind and courteous way in which they had been received there that day. When they, as an Association, went from home to visit their President, they, of course, required the necessary accommodation for carrying on their business and holding their meetings. That day they had been fortunate in having had placed at their disposal a noble College, which, he might say, was an ornament, as well as an acquisition, to the town. For this, they were deeply indebted to the Darlington Technical Instruction Committee, to whom he had the greatest pleasure in proposing, on behalf of the Association, their very cordial and best thanks for their kindness and courtesy.

Mr. J. Lewis (Newcastle) had great pleasure in seconding. He was sure the Association were very much indebted indeed to the Darlington Technical Instruction Committee for allowing them to participate in their hospitality. As they approached the College, they were struck with the beautiful architecture of the buildings; but, on entering, probably they were struck more so with the fittings of the place, with the appointments, and with the manner in which everything was set out for the good of education generally. Their Association was a technical one, similar to the College; and they could claim some little kindred relationship with the administration of the institution. They could therefore appreciate more highly the kindness which had been bestowed upon them that day.

The motion was agreed to; and the business of the meeting concluded.

After the meeting, the company drove to the Darlington Gas-Works, in John Street. These are intersected by the River Skerne, and are bounded on one side by the railway from Darlington to Barnard Castle, which, at a high level, passes, beside the works, over the Stephenson Bridge, referred to by Alderman Barron. The works are not modern; and there is not within them any of the newer plant, such as the mechanical appliances which are now becoming so common. They are roomy, and are well equipped with plant of a work-a-day order, arranged so as to make their operation easy and economical. On the western side of the Skerne is the older portion of the works, now confined almost entirely to a retort-house and purifier-house. In the newer works, the retort-house is a massive structure, containing 193 through retorts, regenerator fired. Running almost parallel with the retort-house, is a still more imposing building, which is used as a coal-store. The railway runs at the back of it; and the coal, coming in at a high level, is dropped into a series of hoppers, of which there are twelve, each capable of holding 200 tons. From these, the coal is drawn by shoots which discharge at the level of the retort-house floor; and before the barrows are emptied, each is weighed. In the exhauster-house are two of Waller's four-blade machines, steam driven, each capable of passing 70,000 cubic feet of gas per hour; and there is kept as a stand-by a vertical exhauster made by Anderson—a machine of great age, but still in thorough working order. There is a very fine battery of annular condensers, containing twelve columns, 30 feet high; and adjoining them are three vertical cylindrical scrubbers. The purifier-house contains four oxide boxes, each 45 feet by 18 feet, and two lime catch-boxes, each 18 feet square. On the other side of the railway, is a large area of ground, upon which the erection of extensions to the works is about to be undertaken. A beginning has, in fact, been made upon the site, in the construction of a new gasholder. Of this structure, the tank has been completed—the work of Messrs. Smith Bros., Limited, of Burnley. The tank is 140 feet in diameter, and 25 feet deep. It is situated in a hollow which had been excavated and filled up with slag. In the formation of the tank, a good deal of clay and sand was encountered towards the bottom, which has been utilized—the clay for puddle, and the sand for building purposes. The erection of the ironwork has just been begun; the Contractors being Messrs. Newton, Chambers, and Co., Limited, of Sheffield. This is the fifth holder in connection with the works, and is much needed; the present total storage capacity being only 900,000 cubic feet. The company having viewed the new tank, were taken into the country for a drive, which was curtailed so as to allow of a return in time for dinner. The drive was greatly enjoyed; there being much beautiful scenery and many very pretty residences in the neighbourhood.

The dinner was held in the King's Head Hotel. Mr. Tarratt in the chair, was supported right and left by Mr. W. E. Pease, the Mayor of Darlington, and Alderman Barron. Among the company, which numbered over 100, were the members of the Gas Committee of the Corporation. The toast of "The North of England Gas Managers' Association" was proposed by Alderman Barron, and responded to by the President. That of "The Mayor and Corporation of the Borough of Darlington" was proposed by Mr. T. Bower, of West Hartlepool, and responded to, in a happy speech, by the Mayor. The proceedings were somewhat protracted, but were brought to a close in time to allow of the departure of members by the 7 o'clock trains.

PACIFIC COAST GAS ASSOCIATION.

Annua Meeting at San Francisco.

The Eleventh Annual Meeting of the Association was held at San Francisco, Cal., on July 21, 22, and 23—the President, Mr. M. C. Osborn, of San Francisco, occupying the chair. There was a good attendance.

General Business.

The proceedings opened with the election of new members. There were 19 proposals for active, and 18 for associate membership; and these were all accepted. The Library Committee presented a report (which included a catalogue of books), which was of an encouraging nature. During the year donations to the value of £25 had been received. The sum of £10 had been expended on additions to the library; leaving a balance of £55 in hand. There had been frequent calls for books, and inquiries having reference to special subjects, showing that the library was of service to the members.

Inaugural Address.

The President, in commencing his address, alluded to the vast natural resources of their district. In the North, there were large coal deposits and abundance of water power, and in the West enormous stores of petroleum easy of access. Their business had enjoyed a year of unparalleled prosperity; and the lighting question on the Pacific Coast was on a more satisfactory basis than at any previous time. The first works in the district were built in 1858, and the last in 1902. The highest commencing price was £2 1s. 8d. per 1000 cubic feet, and the lowest 2s. 2d.; the average for the 26 companies who had replied to his inquiries being £1 1s. 6d. The highest present price was 12s. 6d., and the lowest 2s. 2d.—an average of 6s. 4d. per 1000 cubic feet. This showed excellent progress, which was due to a good understanding between technicians and capitalists, and to the competition of electricity and petroleum. There was a unity of action towards selling at the lowest possible cost; and the advent of electricity was a valuable educating agent. In most cases gas and electricity were united under one management. Many of those present were no longer gas men alone, but lighting men engaged in the lighting business. The competition of electricity for lighting had led to enormous strides in the development of gas for heating and power. Much engineering skill and business energy had been applied in this direction, with the result that more gas was sold to-day than would have been the case if electricity had not become practicable. Public ownership was being agitated in some places; but he noticed that in the two municipal undertakings in their district, the price was respectively 1s. and 4s. per 1000 cubic feet more than the average price charged by the companies. Prepayment meters had not taken on so well in their district as in the Eastern States and in Europe. Alluding to the library, he suggested head-quarters for the Association, with a Librarian

in charge. He was in favour of extending the Association to take in electric interests, and of changing the title to "The Pacific Gas and Electric Association."

On the motion of the President, it was agreed to amend Articles 3 and 5 of the bye-laws, to admit of companies, firms, or individuals engaged in the manufacture or sale of gas being eligible for Association membership, entitled to not more than four representatives, and that the fees for each active member or representative should be £1 1s. per annum.

Protection of Metal Surfaces in Gas-Works.

Mr. L. P. Lowe read a paper on "The Practical Protection of Metal Surfaces in Gas-Works." He confined his attention to paints and painting, and remarked that many engineers purchased this class of material on no better authority than the volubility of the salesman. Patented paints with high sounding titles should be avoided unless the composition was known. Of the pigments available for use in gas-works, he named asphalte, carbon, graphite, iron oxide, red lead, tar, and white lead. The only suitable vehicle or carrier that he knew of was a high-grade and perfectly pure linseed oil, either raw or boiled. The raw oil usually required the addition of a drier; but the boiled oil was self-drying. All paints on the above list, if properly prepared, were good; but some were much better than others for particular purposes. Asphalte was prepared for use cold by the addition of carbon disulphide or other volatile solvent; but in this form it was brittle and apt to peel. Asphalte applied hot was more likely to be a success; but all paints applied hot were difficult to work, and liable to bubble and blister. Asphalte paints should be pure and free from acid; and it was difficult to ensure this condition. Carbon paints—lamp-black or graphite—were permanent. They were of such low density, however, as to give but little body, and required a large percentage of driers. The mixture with oil being purely mechanical, the life of the pigment was practically governed by the life of the vehicle. Iron oxide was more generally used than any other paint, more because it was cheap, easily procured, well advertised, and of pleasing tint, than for any intrinsic superiority, though its record was not entirely a bad one. Before it could be safely used as a pigment, it must be thoroughly dehydrated; and, like carbon, it was a purely mechanical mixture with the vehicle. Tar paint was liable to the same objection as asphalte, and, in addition, required careful preparation to get rid of water. All paint pigments should be pure and ground to pass a mesh of 250 to the lineal inch. The author believed there was only one best paint for metal; and that was red lead. It had a strong affinity for linseed oil, and formed with it a hard, tenacious, elastic, and durable coating. Unlike other pigments, it formed a chemical combination with linseed oil which, when dry, was a cement of uniform composition, unaffected by moisture, common acids or alkalies, or galvanic action. The red lead must be pure and well ground, and the oil genuine. In these conditions, it could not exist as a ready-mixed paint. He submitted that any difficulty or bad experience with red lead was due to the use of spurious imitations; and he doubted the quality both of lead and oil unless purchased from reputable dealers or in unbroken packages bearing the brand of reliable makers. He recommended red lead for all metal surfaces in or out of ground. It required more care in mixing than some other paints; and for this purpose the use of a paint mill was recommended. It must be remembered that lead paint "sets," and that therefore all utensils should be cleaned while fresh. The theoretical proportion was 33 lbs. lead to 1 gallon of oil; but no fast rule need be observed—the ingredients being simply mixed to a proper consistency. A gallon of linseed oil weighed about $7\frac{1}{2}$ lbs.; and 24 lbs. of lead to $5\frac{1}{2}$ lbs. of oil made a gallon of paint. This quantity, properly laid on, would not cover more than 800 square feet, though some makers claimed it would do 1000 feet. The vivid red could be reduced to a rich brown by the addition of small quantities of lamp-black—$\frac{1}{12}$ oz. of lamp-black per pound of lead giving a pleasing seal brown. It should be remembered that black is only a colouring matter, and the less used the better. The author preferred boiled—really boiled, and not merely coloured—oil to the raw. Red lead paint, on account of its great body, required rather more careful laying on than other paints. It was a mistake to suppose that any boy or labourer could paint. On metal surfaces, the first or priming coat should be the heaviest; and new work should receive at least two coats, of which the first should be lead and oil only. The addition of a proportion of white lead improved the working qualities of the paint; but for priming, red lead only should be used. The proper preparation of a metal surface was highly important. All rust, scale, grease, and dirt should be removed; using wire brushes with short, stiff teeth, and scrapers made of old files. Rubbing with red or fire brick was also a good plan. Deep rust marks should be soaked with kerosene and thoroughly burnt out with a painter's torch. Kerosene was very useful for loosening rust; and the heat of the torch, properly applied, dehydrated the oxide and prevented further corrosion. All surfaces to be painted must be perfectly dry; and painted surfaces should not be scratched or otherwise injured. Gasholders frequently suffered through not being competently painted in the first place. There was a great deal of adulterated red lead on the market; and the moral was "select your own material and mix only as wanted."

Discussion being invited, Mr. Dole said he had treated service-pipes by dipping them in asphalte paint, and also with a mixture of tar and turpentine; but he could not say how it would last. Mr. Beck had not used much red lead; but what he had used was in good condition after being in the ground for a year. For services, he employed chiefly a tar paint, made from a mixture of coal and oil tar. He painted his gasholders three years ago and the scrubber ten years ago with crude oil tar fresh from the well; and the work was as good as when first done. Mr. Britton said his method was to clean the service-pipe bright with carding cloth, put it on slings, pass exhaust steam through it until heated to about 100°, and then apply the mixture of coal and oil tar with a brush. This coating dried with a gloss; and 20 years' experience showed that it was impervious to moisture or action of soils. He had taken up cast-iron pipe originally painted with red lead that had been laid nearly 20 years, and the paint was as fresh as when put down. The cost of the tar coating was about ¼d. per foot for 2-inch pipes; and the coating was a hard enamel, not at all brittle. Mr. Aldrich could not agree that red lead was a panacea for all corrosion troubles. He advocated gas-oil tar as the best and most successful preservative of iron or wood. Pure rubber dissolved in turpentine should be well mixed with it by the aid of heat. He agreed with the importance of cleaning the work thoroughly; and if a holder was well prepared as recommended in the paper, and painted with this mixture, it would last at least five years. He painted a smoke stack, 60 feet high, in this way three years ago, and it was now as good as new. He did not take exception to the author's preference for red lead; but he believed they could use the ingredients from their own works, with the addition of a few shillings for rubber, at a much less expense, and with better results. Mr. Foveaux had recommended oil tar for use on ships; and it proved satisfactory. Mr. Parker painted service-pipes in the manner described by Mr. Britton, with good results. He had seen a holder that had been in use 20 years, which had been painted with tar once a year; and the metal was bright when exposed by scraping. Mr. Hollidge used nothing but oil tar as paint, whether for brick, wood, or metal, at his gas-works, and also at the power station. It answered beautifully, and, among other things, was an excellent preservative for mortar joints. If he were buying a holder, he would specify red lead, which was used as the first coat on all iron ships. Neither the English nor the American Navy would use oil tar if it was given to them. Mr. Grimwood wished to know something about the comparative cost of red lead and tar. Mr. Weber said that the cost of painting 2-inch pipes with two coats of red lead was about ½d. per foot, and smaller sizes in proportion. Mr. Osborn thought it was easier to secure even coating with red lead than with a paint that was about the same colour as the pipe. He objected to having new ironwork painted before inspection, as the paint served to conceal defects. Mr. Eichbaum said that coal tar would dry hard and brittle; but oil tar never did so. Mr. Valentine had cleaned two holders that were coated with tar and no red lead; and he found the metal in excellent condition. He also took up a main pipe that had been laid 25 years, and which had been originally coated with asphalte or tar paint, and it was perfect. Mr. Clements agreed with the red lead proposition, and considered it the best preservative for gasholders and exposed work. Mr. Grimwood said that pipe could be painted with tar for about ½d. per foot; and he did not think red lead offered sufficient advantage to cover its extra cost. A very small amount of linseed oil added to the tar was an advantage as rendering the paint less brittle, and turpentine was good as a thinner and drier; but the less turpentine used the better. This applied to pipes underground. When it came to painting metal surfaces above ground, there were other considerations.

Mr. Lowe, in replying to the discussion, said he knew it was revolutionary to come to a meeting of gas men and advocate anything but tar. But he saw no reason to disparage the great advantage of red lead—that it formed a definite chemical compound with oil, while other pigments did not. Oil tar was no doubt good; but he maintained that, when durability was considered, red lead was really cheaper in the end. Turpentine and rubber were best left out of the oil tar—it would do better without them. Where heat could be applied, oil tar made an excellent coating, though he maintained that even then red lead was better; but it was not practicable to steam the inside of a gasholder. Patent paints were, to his mind, about on a par with patent medicines. The first cost of a paint was not an important consideration if it was more durable as a preservative.

High-Pressure Distribution.

A paper on the above subject was read by Mr. John A. Britton. Extracts from this appeared in the "Journal" for Sept. 1 last, p. 563; and we now give the discussion upon it.

Mr. Lowe thought that pumping at 150 lbs. pressure was not at present advisable. A great deal depended on having a reliable governor before each meter, as a high pressure would burst the meter. Gas-compressors were built for single or compound action; and if 60 or 70 lbs. pressure was exceeded, compound action, the compression taking place in two or more stages, was necessary, and then compression became expensive. As governors were now made, they could not be depended upon beyond 75 lbs. pressure; and while the mains might stand 150 lbs., the governors would not. Compression tanks should be about $4\frac{1}{2}$ feet diameter, and just under 30 feet long, for convenience of transit. Such a tank, made of $\frac{3}{16}$-inch plate, would

have bursting strain of 300 to 400 lbs. per square inch, and would cost £75. It would be safe for 75 lbs.; but 150 lbs. would require a much more expensive tank. In his opinion, it was much cheaper to use compression tanks than to depend upon excessive size of mains for storage capacity. Every 15 lbs. additional pressure meant the addition of the cubical capacity of the tank to the storage. Mr. Parker had a feeder 8 miles long, of 2½-inch pipe, delivering into trunks of 2-inch and branches of 1-inch pipe. He had no compression tanks, but pumped with an 8 inch by 8 inch by 12 inch compressor direct into the feeder, at a pressure of 10 to 35 lbs. A No. 2 equitable governor was fitted before each meter, with a safety device that would sound a whistle with excess of pressure on each governor outlet. He supplied 150 customers, and had stopcocks at each branch; so that any section could be shut off. The whole was tested for leakage, and only nine leaks were found. These were at the junction of the ¾-inch services with the 1-inch pipes, and appeared to be due to the gasket used. All sockets were of the hydraulic pattern; and Dixon's pipe-joint compound was used. On account of the difficulty of getting a sound connection off the 1-inch mains, he would prefer to lay not less than 2-inch pipes. Mr. Aldrich asked for further particulars as to cost of compressing apparatus and tanks. He understood the latter were only necessary when the high pressure was used in conjunction with the ordinary system. He would also like to know whether district or individual governors were preferable; also the cost of pipes, whether expansion joints were used, and why dead-ends were avoided. Mr. Colquhoun had tried high-pressure distribution. He was rather nervous about it at first, but after experience preferred it as doing away with all the evils of low pressure. There was no complaint about not enough gas for the stoves, no naphthalene, and no condensation of liquids. The consumers were better satisfied. Mr. Grimwood had supplied at high pressure, carrying as much as 35 or 40 lbs. up to the consumers' governor; but he considered it advisable to use district governors that delivered at 25 lbs. on the outlet. The consumers' governors would reduce this to 4 inches of water; and they gave absolutely no trouble. He believed in an extra size of pipe in preference to storage tanks. Twenty miles of 2-inch pipe had a capacity of more than five such tanks as those mentioned. It was true that the delivery could be increased by raising the pressure, but any substantial increase of pressure meant a large increase in expenses. He therefore advocated pipes of ample size. Some of the high-pressure plants described would soon be found to have run into too small sizes of pipe. Mr. Eichbaum said that people used to be satisfied with 1½ inches pressure; but now they wanted 4 or 5 inches. Mrs. Enloe (a lady lecturer) strongly advocated plenty of pressure.

Mr. Britton replied, and said that a blower to supply 50,000 cubic feet per hour, at a pressure of 10 lbs., would not cost more than £160 fixed complete; and a compression tank, as described by Mr. Lowe, about £80. For high pressure, district governors should always be used, and for all pressures above 8 oz., individual governors also. The equitable iron 5-diaphragm meters would stand quite 50 lbs. per square inch. The No. 2 governors cost about 10s. each, and smaller ones less. There was no special reason for avoiding dead-ends. At Oakland, he had high pressure for several years; and the loss over the entire system was under 9 per cent. All the pipe was cast; he had no wrought high-pressure pipe. He had often utilized existing mains for high pressure. As Mr. Colquhoun said, high pressure did away with the troubles of low pressure. He had ample condensation at the works; and this might account for the fact that out of 75 drip-boxes only one contained any appreciable quantity of fluid all through the winter. The initial pressure on the high-pressure system was 2½ lbs., falling to 3 inches of water at the far end. There were 3000 consumers on the system. The district governors reduced the pressure to about 5 inches at the outlet. A round tin-case meter would stand 15 lbs. before bursting. One of the advantages was that with 25 lbs. or over the storage capacity of a system of mains was considerable; and the pressure could be increased according to the consumption. It was a good thing to give ample pressure at the meter; but this was not the primary object of the high-pressure system.

Selling Cookers at Half-Price.

Mr. Britton, according to promise last year, gave the results of selling cookers at half-price. He had sold 378 stoves, which cost nearly £3 10s. each, and had received about £1 14s.—showing a loss of £1 15s. per stove. The average sale of gas was 17,300 cubic feet per stove, which he calculated to show a profit of 18s. 4d. per stove per annum, after allowing for all costs.

(To be continued.)

OIL AND TAR BURNING IN CALIFORNIA.

A correspondent of the "American Gaslight Journal" recently visited and inspected some of the plants employed for burning oil and tar in California; and in the issue of that publication for the 21st ult., he gave the following account of what he saw.

Oil and tar burning in California has not been in use for many years, except on a small scale, and nearly all of the apparatus now in service is of new design. At one works where they are burning oil of a very cheap grade for bench work in manufacturing and machinery departments of large works, the furnaces and generators of the benches are filled with ashes, and the openings on the top of the generators are covered with a tile device which is effective in its work. These precautions are taken to prevent explosions which are occurring in some shops where they are careless in the use of oil for burning for bench work. Standard burners are used, fitted with the necessary attachments for combining the air, oil, and liquid tar to best advantage. The oil used is pumped from the storage tanks just outside the works into tanks which are arranged over the benches. This gives the required pressure to the oil and facilitates the work. An air supply of about 18 inches of water pressure is applied. With light oil, in this arrangement, a good, even heat is sustained at the benches, and one man is able to regulate a considerable number of fires. In cold countries, it would be necessary to heat the oil in the tanks with a coil of pipe; but in this climate there is no need of artificial heating. The light grades of water-gas tar can be utilized to advantage in this device.

There are various descriptions of burners in use in the oil and tar burning plants of California, and from personal observation I am inclined to believe that some of them are quite original in design. I saw some of different pattern from any seen in the East. There are some ingenious persons here on the Coast who are experimenting extensively with burners for making the oil supplies of the country more popular, by its large use in bench work and other lines of work apart from power developing and heating. In fig. 1 is shown a plan of a burner which is of

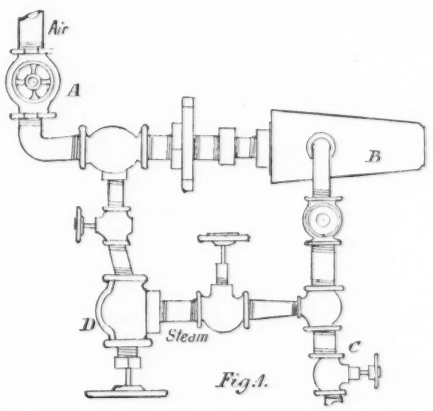


Fig.1.

Western design, and which has been used advantageously at both bench work and in power development. In this burner steam is also employed. The air is received into the device through the upper pipe, in which there is a valve A. This valve must be of good design, tight, and reliable. It will not do to use a poor form of valve here, as it will leak. I saw that they were experimenting with a device of this pattern, and the air-valve which was employed leaked badly, so that there was no effective means for regulating the changes of air or shutting off the air supply entirely when so desired. The dome B is employed for a retort for the air and surplus steam. The steam-valve is at D, and the steam charges are received into it by means of a pipe joined in on the opposite side. The outlet for the combined air, steam, and oil is at C. Just above the outlet on the other side, and not shown in the front view of the burner, is the valve with piping employed for letting in the oil or tar, whichever it may be. The oil is drawn from tanks about 12 feet above the level of the inlet piping, so that ample force is obtained. If tar is used, the same arrangements of piping are utilized.

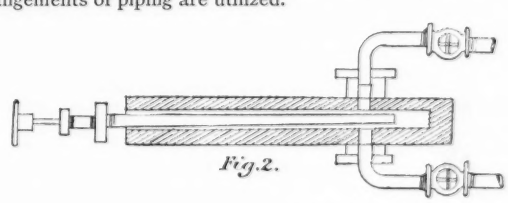


Fig.2.

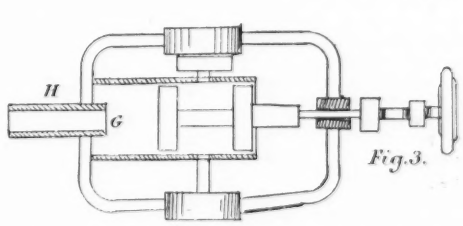


Fig.3.

I also saw some very simple patterns of burners in use, such as the one shown in fig. 2. This is a central sectional view, and the plan can be readily outlined. The air is passed in through one of the pipes, while through the other steam is drawn if required.

In fig. 3 is a design of burner made and used at an iron-works in

San Francisco. There is a central cylinder inside of a metal chest, and inside of this cylinder is a piston and valve for controlling the charges of oil. G is the interior of this cylinder, and H the pipe through which the mixed air and oil are drawn. The oil, with sometimes tar, is admitted through either the upper or the lower pipe connections, which are fitted above and below to the main chest.

Although some of the users of oils and tars in power raising and heating and bench work in the State of California are not quite so far advanced in the employment of modern devices as the users of oils and tars for this line of operations in the Eastern and Middle States, I noted that the Californians had invented some pretty good devices for use in this line of work. Take, for instance, the nozzles used in delivering the oil charges to the steam or air chambers for mixing. The interior forms of these nozzles are often so arranged as to retard the movement of the flow. Again, the nozzle being full open from end to end, no adequate means are afforded for controlling the charges and miscellaneous pressure of liquid results. The feed being uneven, the resulting work is poor and unreliable. To overcome this defect, nozzles have been introduced leaving the opening and the outlet full and free, but the middle course depressed by the centre being gradually reduced in diameter. If this reduction in proportions were not made on scientific lines, it would be worse than not having it at all; but if it is correctly designed and properly smoothed

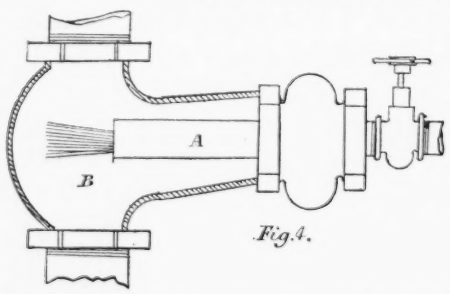


Fig. 4.

or the flow of the oil, tar, air, or steam, the resulting charges are more likely to be under control and uniform than when smooth and straight bores are used. The reduced portion tends to twirl the stream which passes through, and, checking it for a little, causes it to expand as soon as it is released in the more open portion near the outlet. In some of the California plants in which oil, tars, and other liquids are burned, I observed various serious defects. In one place the old-time mistake was made of making a charging-pipe enter a chamber or globe, as shown in fig. 4. The illustration shows the interior of the globe, and the charge of oil, tar, steam, or air enters straight out into B through the pipe A, striking with force against the globe. When steam and air are thus introduced into a chamber, where the chances for getting a hard, frictional contact with metal are good, as in this case, the metal is very liable to become worn thin in a comparatively short time. If oil is thus forced into the chamber and against the metal wall, the chances for the wearing of the metal are great, and in a year or two a new part is needed. If the charges are of the tarry sort, the work of a few months may be sufficient to ruin the globe. Introductory charges of air, steam, oil, tar, or other ingredients, should not be permitted to enter a chamber in this manner. The pipe which goes into the globe should be inclined in such a way as to cause the charges to strike at an angle, giving them a chance to glide swiftly over the walls instead of striking them direct.

GAS v. ELECTRICITY FOR LIGHTING SCHOOLS.

The Bavarian Home Minister, whose department supervises the schools and churches, some time ago ordered an inquiry into the question of the relative value of incandescent gas and electric lighting for schools. Dr. Seggel, the Chief Court Physician, was accordingly commissioned to make a report, which has been approved of by the Faculty of Medicine of the Royal University of Munich, represented by Professor Eversbusch. The latter differed slightly from Dr. Seggel on one point; but, after consultation, the two reporters agreed. The following are the principal points of the reports.

According to Erismann, artificial lighting should meet the following requirements from the hygienic standpoint: (1) The light should be well and abundantly diffused; (2) the temperature and composition of the air should not be perceptibly altered; (3) the calorific rays should be as slight as possible; (4) the light should not irritate or fatigue the eye or endanger health or life; and (5) it should be as cheap as possible. Petroleum and batswing and argand gas-burners were excluded, and only incandescent gas and electricity entertained. It is pointed out, at the commencement of the reports that, whereas incandescent electric lamps can be employed for direct, and arc lamps for indirect lighting, the Auer burner is suitable for both. The question to be decided therefore was which light should be adopted.

As direct sources of light, gas and incandescent electric lamps are comparable; and as indirect sources, the arc lamp and gas. Incandescent gas has the following advantages: It is more evenly diffused than electric light, and better illuminates side places. From observations made with the Cohn photometer, it was demonstrated that with a 16-candle incandescent electric lamp the best illuminated disc near the lamp was as bright as day, but at a distance of 60 centimetres the light was defective, whereas it was sufficient with the Auer burner. Incandescent gas gives a greater light in general—viz., 56 metric candles for 16 or possibly 32 with electricity—with a slighter radiation of heat; it being 1·37 calories with gas and 2·53 calories with electricity. On the other hand, gas has the disadvantage of imparting to the air more heat, through hot gases and steam, than electricity. This disadvantage, however, is nothing in comparison with its advantages, because the products of incomplete combustion which impart an odour to the air of rooms, and make it injurious to health, disappear entirely, or at all events partially, and the temperature of the air is little higher than it is with electricity. Moreover, this increase of temperature and vitiation of the air can be prevented by proper ventilation.

Coming to the question whether direct or indirect lighting should be adopted for large rooms such as those used for schools and lecture-rooms, &c., the authors lay it down that direct lighting has the single advantage that, with a sufficient number of flames, it gives a greater quantity of light for the working area. On the other hand, it is inconvenient as regards radiated heat, and is dazzling. Radiation of heat dries the eye, and causes headache; while the dazzling brilliancy of a light inflames and fatigues the retina, so that a stronger light is constantly needed. These defects can, however, be avoided by having shorter flames and conical shades, allowing little light to pass. As all of it is thus thrown on to the working area, the rest of the room is relatively dark; and the higher the illumination the greater the contrast. As scholars are in the habit of looking at the dark place in the school in order to collect their ideas, their eyes consequently suffer. In lecture-rooms, or when giving lessons at a blackboard, when all should be able to see, this system of direct lighting, where one lamp is scarcely enough for a pupil, is not at all suitable.

With indirect lighting, the sources of light neither dazzle nor radiate heat; and they have besides the advantages over direct lighting that the light is more uniform and more evenly diffused, and there is no shadow or consequent failure of light. With direct lighting, when each pupil has not a lamp, the shadows of head and hands, &c., cause the light to be less than it would be by photometric test in an empty room. According to Pelzer, the loss may exceed 50 per cent.; and the shadows are greater as the direct light is stronger. Boubnoff states that a light of 8·2 candles was reduced to 4·6 candles by the shadow of the head while writing. Direct lighting of places used for study is consequently only possible with numerous lamps conveying light from the left-hand side, each being furnished with a shade; but, owing to vitiation of the air, this system of lighting would only be possible with electricity, and, moreover, would be exceedingly expensive. Evidently, with indirect lighting, based upon the reflection of light by the walls and ceiling, a considerable amount of diffused light is lost by absorption. This loss is estimated at from 20 to 40 per cent.; but really it is not so great. Erismann demonstrated this with six incandescent gas-lamps in a school 72 square yards in area. The average illumination in metric candles was—

	Maximum.	Minimum.	Average.
Direct light	25·3	17·5	9·7
Indirect ,, ...	19·1	16·2	13·3

To obtain indirect lighting, opaque reflectors are placed under the lamps, which throw all the light against the ceiling and the top of the walls, so that it is reflected through the room. Professor Renk disparages this system, as giving light in one place and leaving the other dark. However, in the experiments he made at the Hygienic Institute of Halle, he had no Auer burners. He utilized regenerative burners, which possessed all the other advantages of indirect lighting; but the light on the tables—20 metric candles with direct lighting—was reduced by two-thirds, and was consequently insufficient. Therefore, instead of the opaque metal reflectors first employed, he adopted opal glass, which allowed a certain amount of light to pass, and subsequently lined glass globes. Praunitz recommends opal glass reflectors resting on brass plates, having orifices of 6 centimetres below and 25 centimetres above; the height of the side being 14·15 centimetres. He estimates that to light with incandescent gas an area of 14 square yards and a height of 12 feet, the lamps should be placed at a distance from the wall of half that separating them from each other. He maintains that this is the best system of lighting for workshops, lecture-rooms, and school-rooms, where the work is not too fine, and uniform light without shadow is needed; and he says 10 metric candles are quite enough. Erismann, on the contrary, advocates 20 metric candles for small work, and from 12 to 15 candles for large, with a minimum of 10 candles.

The sympathy of the professional friends of Mr. S. Meunier, of Stockport, will, we are sure, be extended to him in the severe bereavement he has recently sustained by the loss of his wife. Mrs. Meunier suffered from an affection of the heart, and her death occurred rather suddenly after an attack of illness when on her way home.

CONSTRUCTIONAL DETAILS AND COSTS OF RECENT EXTENSIONS (1900-1902), WITH NOTES ON WORKING RESULTS, AT THE TYNEMOUTH GAS-WORKS, NORTH SHIELDS.

By A. Clement Hovey.

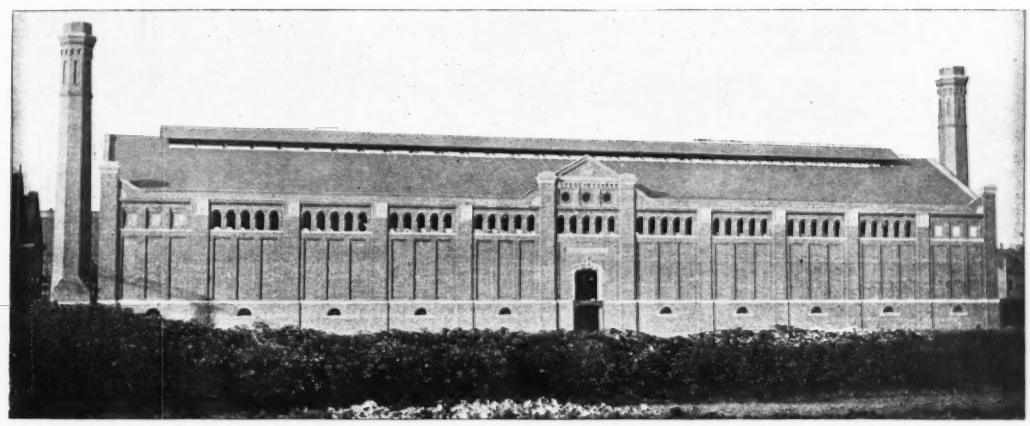
[A Paper contributed to the North of England Gas Managers' Association.]

In the following description of the recent extensions at the Tynemouth Gas-Works, North Shields, attention is directed more particularly to the details of construction, the actual capital expenditure, and to working costs, rather than to the general arrangement of the new sections, upon the comparatively extensive site.

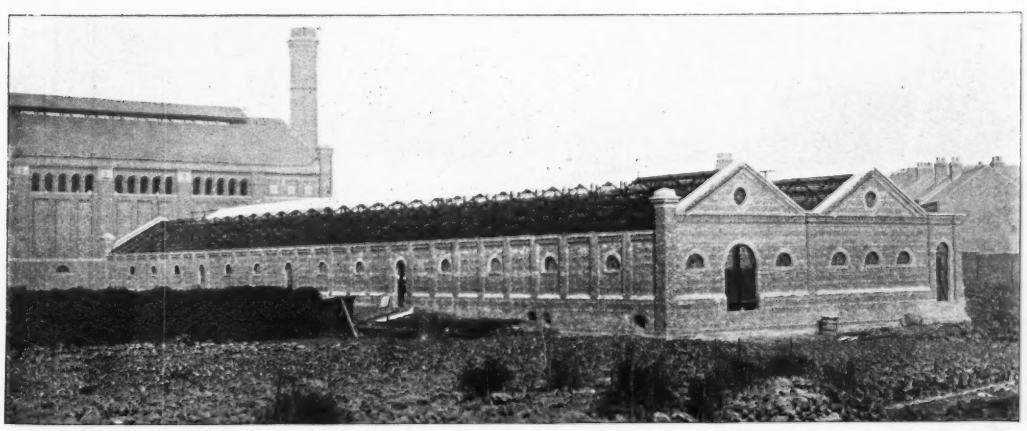
The growth of the Tynemouth Gas Company's business has been rapid; the gas made per annum having increased from 225 million cubic feet to 387 millions, or by 71½ per cent., during the last decade. The average increase per year for the last two years was 7¾ per cent. The area supplied is nearly 12 square miles, the population is over 60,000, and there are 13,000 consumers.

Every retort was in operation at the same time for a short period in the winter of 1900-1901; and the whole of the manufacturing plant was working at its maximum capacity.

Complete additional works were necessary, as plant, and buildings containing the plant, for dealing with the gas after leaving the retort-house could not be economically, or even reasonably, altered for further increased production. The necessity for additional and improved works had been foreseen; and they were commenced early in the year 1900. The merits of



No 2. Retort-House (Side Elevation.)



View of the New Purifier-House.

machinery over hand labour in connection with the carbonizing plant in gas-works of large and medium size being fully recognized by engineers, and consequently adopted when the opportunity occurs, there is no necessity to recite all the well-known advantages. They may be summarized in the statement that the conditions under which the workmen accomplish their duties are enormously improved, and the cost of gas manufacture is considerably diminished—thereby tending to reduce the sale price of gas, and to increase the utility of the commodity and the stability of the industry.

Inclined retorts, with attendant coal and coke machinery and large overhead coal storage, possess advantages, and are therefore installed in some works. But derogatory disadvantages—some of which may be to a certain extent overcome—secure the ascendancy of horizontal retorts, with accessory coal, coke and stoking machinery, in many instances. The latter method is that adopted at the Tynemouth Gas-Works. Without further commendation of this system—affecting as it does a large portion of the carbonizing plant—the description of the various details of plant and buildings, and their costs, will now be proceeded with.

Boundary Wall.

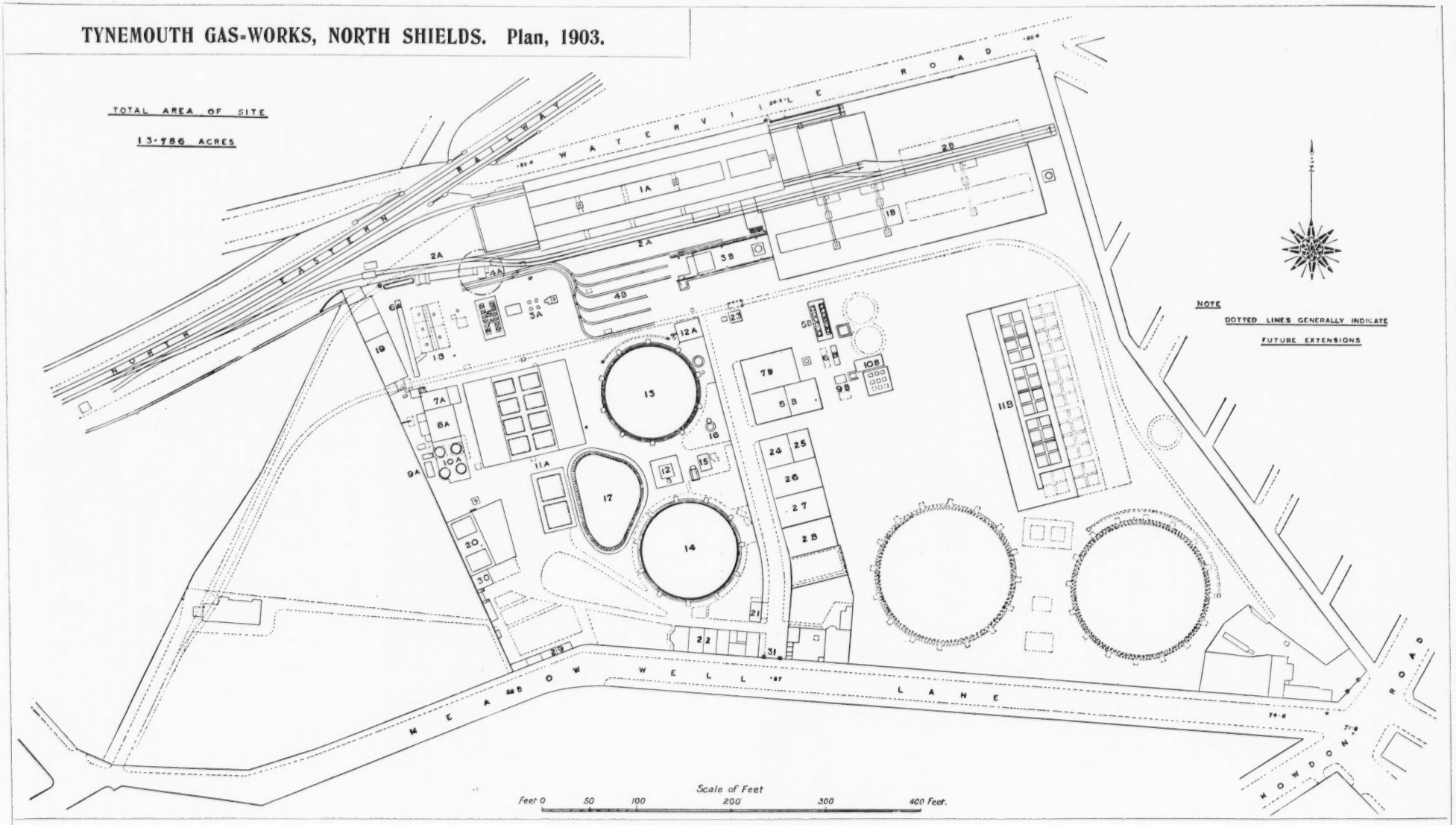
The site of the new section of the works fronts upon public roads on three sides, and upon the old section on the fourth side. A brick boundary wall, 9 ft. 6 in. high, was built upon three sides, and entrance gates provided. The wall fronting upon two main roadways is panelled in brick and capped with stone; and the portion fronting upon a back street is plain outside, with blue tile coping, and strengthened with internal piers.

The panelled wall, 9 ft. 6 in. above and 3 ft. 3 in. below the ground line, cost £2 2s. per lineal yard, and the pier wall £1 16s. per lineal yard, including concrete foundations.

High-Level Railway.

For the conveyance of coals to the stores adjacent to the retort-house, and which are situated on the north side only, an overhead railway for ordinary 10-ton bottom-door tip-waggons was constructed. The first section is connected to the siding by an **S** curve of 150 feet radius. The rail level is 16 ft. 8 in. above the ground floor of the retort-house. The flat-bottom rails, 80 lbs. per yard, are laid upon hard-wood packing-pieces, 1½ inches thick,

TYNEMOUTH GAS-WORKS, NORTH SHIELDS. Plan, 1903.



REFERENCE NUMBERS ON PLAN.

Section No. 1 designated by "A"; Section No. 2, by "B."

1. Retort-Houses. 2. Siding and High-Level Railway. 3. Coke Breakers, Elevators, and Conveyors. 4. Steam Crane and Trolley Railway. 5. Annular Air Condensers. 6. Water-Tank and Water-Tube Condensers. 7. Boiler-Houses. 8. Engine-Houses. 9. Washers. 10. Scrubbers and Pump-Houses. 11. Purifiers. 12. Meter-Houses.

Common to Both Sections.

13. No. 1. Gasholder. 14. No. 2 Gasholder. 15. Gas-Enriching Plant. 16. Water-Softening Plant. 17. Water Reservoir (100,000 gallons). 18. Tar and Liquor Wells. 19. Sulphate of Ammonia Works. 20. Purifiers for Sulphate Works. 21. Governors. 22. Offices and Laboratory. 23. Coke Office and Weighbridges. 24. Smiths' Workshop. 25. Joiners' Workshop. 26. General Stores. 27. Fitters' and Plumbers' Workshops. 28. Stove-Stores. 29. Stables. 30. Cart-House. 31. Entrance Gates.

recessed ¼ inch deep on each side, at right angles to prevent displacement. The rails are bolted through the packing-pieces to steel cross joists (10 in. by 5 in. by 35 lbs.), each of which rests at one end in the wall of the retort-house, and near the other end upon a line of longitudinal steel plate girders (2 ft. 3 in. deep, 12 in. wide, and generally 27 feet span), which are supported by cast-iron columns and spandrils. A number of the cross joists are bolted to plates inside the retort-house wall.

The first section of the railway, extending to near the east end of No. 1 retort-house, was completed in advance of the remainder, in order that the large quantities of building materials and plant might be delivered close to the site of erection.

The coal trains are shunted over this portion of the railway; and, after being emptied, they are returned through No. 1 retort-house to the siding adjoining the main line. The rails in No. 1 retort-house, which were fixed when the house was built, pass over the coal-stores in it. This loop line was therefore in existence prior to the outside railway being built; and all the work necessary to utilize it for the return of empty waggons was to cut through the end wall of No. 1 retort-house, and arrange the outside railway to support points and the cross-over connecting rails. The crossing and points are laid upon ⅜-inch steel plates bolted to the steel joists.

The total width of the railway alongside each retort-house is 10 ft. 6 in., affording ample space for coal tippers to work on both sides of the waggons. The footways are formed of 9 in. by 2 in. battens, laid upon the cross joists. Galvanized iron hand-rails, cast-iron stanchions, and side guard plates are provided. Substantial buffers, built of steel joists and bent rails, are fixed at the terminus of each line.

The total length of the new track is 312 yards. The weight of the complete railway is 14½ cwt. per yard of track. The cost was £10 17s. 5d. per yard of track, including the platforms, points, crossings, buffers, &c.

Compressed Air Capstan.

After the coal-waggons have been shunted on to the overhead railway from the siding, they are moved rapidly as required in either direction, on both lines, by means of a compressed air capstan and snatch-heads attached to the steel joists; the engine and gearing being suspended immediately outside the wall of the coal-stores. The capstan is set in motion by foot pressure upon a plug connected to a balanced lever on a stop valve; and immediately the man's foot is removed from the plug, the capstan stops. The whole of the labour required, owing to the arrangements made, in delivering the coal to the breakers inside the first half of the retort-house and returning empty waggons to the siding—except three or four tipped during the night shift—is accomplished with ease by one man on the day shift. The capstan, tested in July, when the rails were dry and friction therefore greatest, moved six waggons, each containing 10 tons of coal, at the rate of 100 feet per minute when drawing direct, and 80 feet when drawing in the opposite direction with rope around a snatch-head. Two full waggons were drawn at the rate of 208 feet per minute.

Retort-House Building.

The retort-house building was commenced in May, 1900; and gas was made therein by four retort-settings, with hand labour, during the weeks of maximum consumption, towards the end of the following year. During the period of construction, progress was practically stopped for four months, owing to a lock-out of bricklayers in the district.

In designing the building, the breadth and height have not been restricted to the smallest limits possible, and adequate clearance for machinery has been allowed. Ventilation and light and other conditions affecting the workmen have also been considered. The general dimensions of the retort-house are: Length, 294 feet; breadth, 74 ft. 9 in.; height to principal shoes 40 feet, and to stage floor 10 ft. 6 in. from ground level. The easy working capacity of the retort-house is 2½ million cubic feet of gas per day of twenty-four hours, and the maximum capacity 2,822,000 feet, when 3½ cwt. of coal are carbonized per mouthpiece per six-hour charge. The foundations vary from a depth of from 5 ft. to 10 ft. 6 in., according to the nature of the ground and the positions of the coal-breaker pits.

The walls, which are 2 ft. 9 in. thick up to the stage-floor level, are built in cement mortar from the concrete to 6 inches above the ground level. Several semi-circular openings are in the walls below the the stage floor. Above the stage floor the walls are panelled to 1 ft. 11 in. thick, with piers 2 ft. 4 in. to 3 ft. 2 in. thick. Two sets of iron bonding strips are built in the walls. On each side of the house, at a height of 31 ft. 6 in. above the ground level, are 45 arched apertures, 5 ft. 6 in. high, by 2 ft. 9 in. wide, for light and ventilation. Other openings of various sizes are arranged in the gable walls; and there are six pairs of sliding doors at both floor levels.

The coping and plinths of the walls and the pier caps are of stone set in cement mortar. The outsides of the walls are faced with pressed bricks; and the brickwork is English bond in lime mortar. One doorway at the north side of the house is at the level of the railway, and steps lead up to it from the stage floor. Apertures faced with blue bricks were arranged in the gable walls, in anticipation that coke-conveyors would be used; and the conveyors now pass through them.

Pits, three in number, were built inside the north wall of the retort-house for the coal machinery, and arched openings made for the coal to slide through to the breakers from the coal-stores.

Retort-House Chimneys.

Dwelling houses being built in large numbers close to the works' boundary, it was necessary to conduct the residual gases from the retort-settings to a considerable height before they should be dispersed in the atmosphere. The chimneys therefore were built to a height of 100 feet; there being one at each end of the retort-house. The foundations are 16 feet square, and sustain a pressure of 1¾ tons per square foot. The brickwork bases are 12 ft. 9 in. square to the level of the retort-house plinth-line, and there change to octagon section.

Sets of iron bonding strips are laid in the brickwork every 5 feet in height. Each chimney is faced with pressed bricks, built in Flemish bond, and has a 9-inch fire-brick lining to a height of 40 feet; from thence to the top the lining is 4½ inches thick. The coping and cap-stones are bonded with iron clamps in cement. Lightning conductors, having an elevation of 6 feet above the chimney tops, are firmly secured by heavy iron saddles. The clear passage way at the top of each chimney is 29·1 square feet, which is equal to 30 square inches per ton of coal carbonized in one day's maximum make.

The cost of each chimney, complete with flue to the inside of the retort-house wall, was equal to £6 13s. 4d. per lineal foot of height above the ground level.

Retort-House Roof.

The principals are constructed of flat steel bars and angles riveted to steel plates. There is no smithwork or bend of any description upon the bars or plates of the principals. The rafter angles, main ties, and main struts are all double; the smaller ties and struts being single. The span is 75 feet, the pitch of the roof 30°, and the principals are 9 feet centres. There are two small transept roofs; and a louvre ventilator, 12 ft. 6 in. span and 3 ft. 6 in. high, extends 261 feet along the main roof. Diagonal wind bracing, formed of steel angles upon which there is no smithwork, is attached to the principals. The purlins are 2 in. by 2 in. by ¼ in. steel angles, with 2 in. by 2 in. redwood laths, 10½ inch centres, for Duchess slates. The cast-iron gutters are 1 ft. 7 in. wide and 8 in. deep, with four 4-inch square down-pipes recessed in the wall at each side of the retort-house.

The steel tees, angles, flat bars, and plates for this roof, and all other constructional steel work, were specified to be of British manufacture, and to bear an ultimate tensile stress of 26 to 30 tons per square inch, with an elongation of not less than 20 per cent. in 8 inches, and to bend double when cold without sign of fracture. In evidence of the uniformity of the excellence of the steel obtained from several manufacturers for various parts of the works, only two of the many tests made were below the limits specified; and these were scarcely noticeable fractions. The weight of the steel and cast-iron work in the complete roof is 157 tons, or 16 lbs. per square foot of floor area covered.

The average cost of all iron and steel work was 13s. 9·2d. per cwt., or 1s. 11¼d. per square foot of floor area. The cost of the whole roof, slated complete, with gutters, &c., was 2s. 6·4d. per square foot of floor area covered. The cost of the retort-house building, including roof, doors, and quoins, was 8s. 1d. per square foot of enclosed area, or 1·88d. per cubic foot of enclosed space to the roof apex.

Retort-Bench Brickwork and Foundations.

The first section of the carbonizing plant consists of twelve settings, each of eight 22 in. by 16 in. D retorts, 20 ft. long. The foundations are formed of concrete piers, 10 ft. 6 in. centres, 3 ft. 6 in. wide, and 21 ft. long, with intermediate arches. The ground between the piers was excavated with a rounded surface, struck to templates of 5 ft. 3 in. radius. The earth was thus used to form a centre for each of the concrete arches between the piers. The concrete surface to receive the brickwork was finished 6 inches above the ground level. The foundation piers were extended, and had pockets into which the buckstays were set; the remaining space being then filled with concrete, the surface of which is raised and inclined to prevent any water lying against the stays. The concrete is 14 inches thick at the arch centres. The whole of the foundations remain firm, and show no sign of settlement or defect.

The brick piers of the bench are 1 ft. 11 in. thick up to the stage floor, 1 ft. 6¼ in. above that level. The arches have three rims, all built in fine fire-clay and springing from special blocks. The arches are covered, and the haunches backed, with common red brick, grouted with lime mortar, and faced with fire-brick. The ends of the bench are finished with solid piers 5 ft. 6 in. thick at the base, tapering to 4 feet at the arch springer.

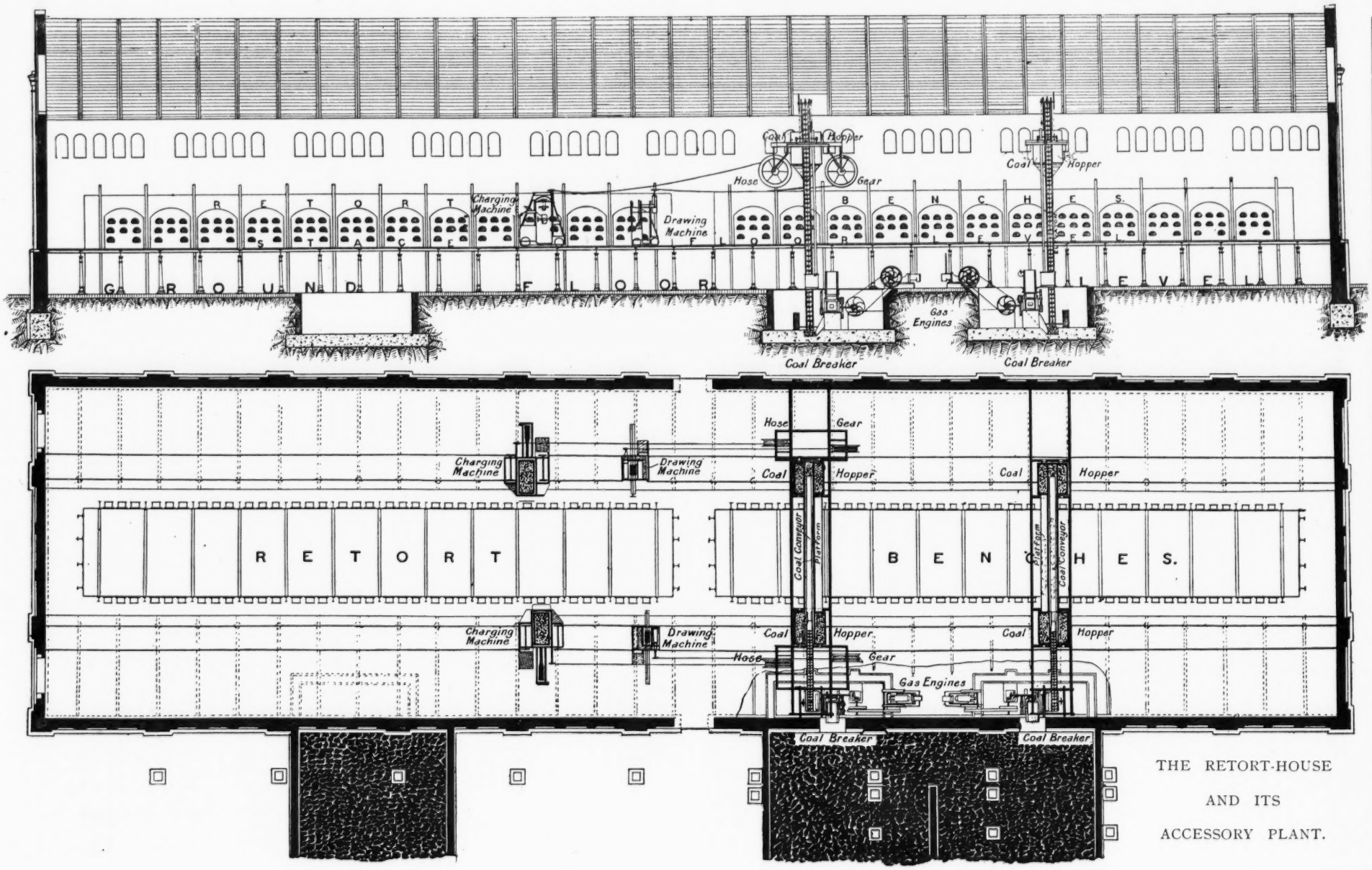
The retort-bench foundations cost £2 17s. 1d. per mouthpiece; the brick piers and arches, £7 9s. 11d.

Retort-Settings.

All settings of retorts are built on the regenerative principle, with one furnace to each through setting of eight retorts. The bottom inside surfaces of the lowest retorts are 1 ft. 5 in. above the stage floor level; and the retorts are set at 2 ft. 2 in. vertical centres.

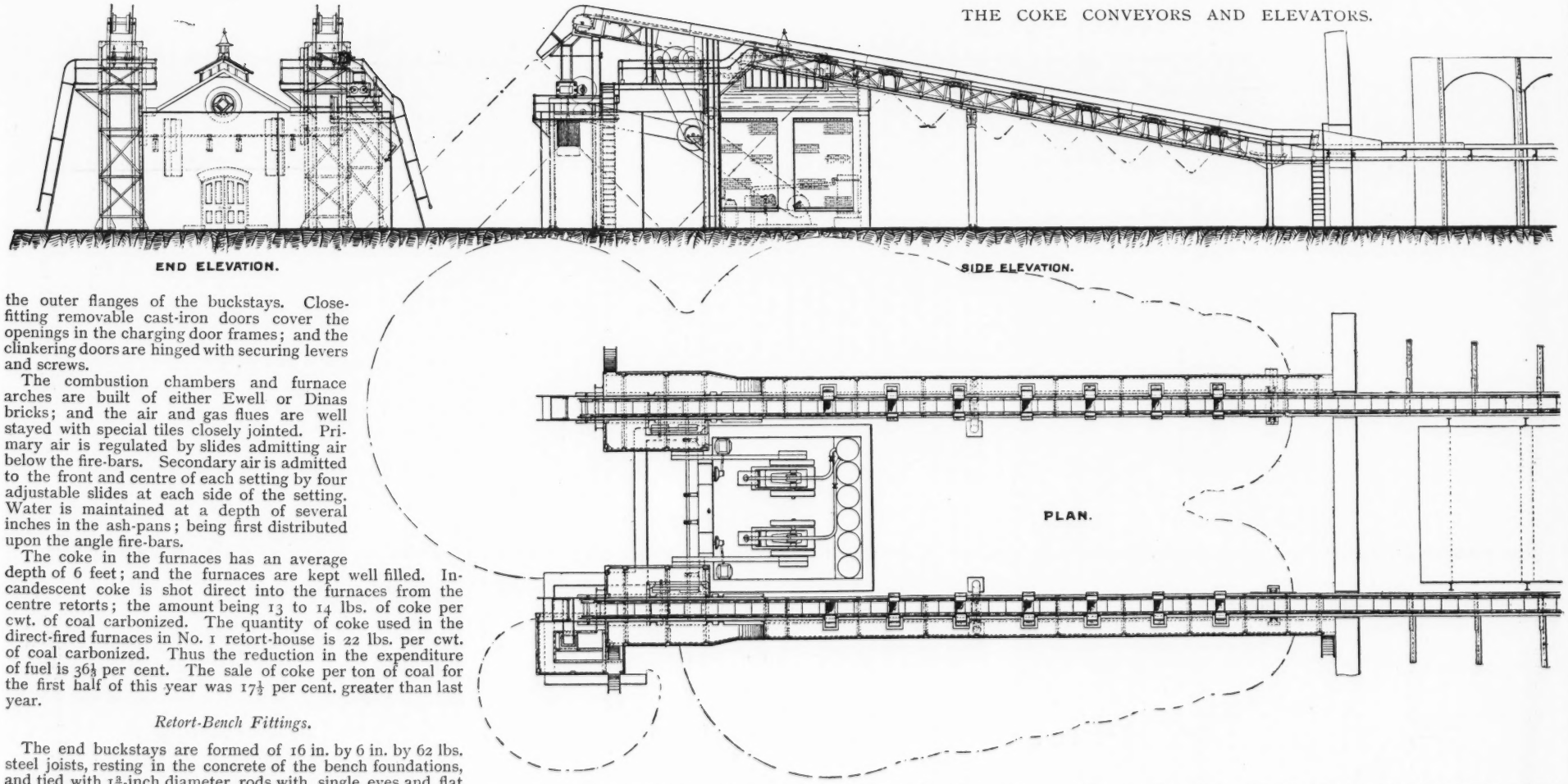
The furnace-charging mouthpieces are set at an angle of 50° with the floor. The furnace brickwork projects 14 inches in front of the general faces of the brickwork, but is then 2 inches within

and Plumbers' Workshops. 28. Stove-Stores. 29. Stables. 30. Cart-House. 31. Entrance Gates. 23. Coke Office and Weighbridges. 24. Smiths' Workshop. 25. Joiners' Workshop. 26. General Stores. 27. Fitters' 19. Sulphate of Ammonia Works, 18. Tar and Liquor Wells.



THE RETORT-HOUSE AND ITS ACCESSORY PLANT.

THE COKE CONVEYORS AND ELEVATORS.



the outer flanges of the buckstays. Close-fitting removable cast-iron doors cover the openings in the charging door frames; and the clinkering doors are hinged with securing levers and screws.

The combustion chambers and furnace arches are built of either Ewell or Dinas bricks; and the air and gas flues are well stayed with special tiles closely jointed. Primary air is regulated by slides admitting air below the fire-bars. Secondary air is admitted to the front and centre of each setting by four adjustable slides at each side of the setting. Water is maintained at a depth of several inches in the ash-pans; being first distributed upon the angle fire-bars.

The coke in the furnaces has an average depth of 6 feet; and the furnaces are kept well filled. Incandescent coke is shot direct into the furnaces from the centre retorts; the amount being 13 to 14 lbs. of coke per cwt. of coal carbonized. The quantity of coke used in the direct-fired furnaces in No. 1 retort-house is 22 lbs. per cwt. of coal carbonized. Thus the reduction in the expenditure of fuel is 36⅓ per cent. The sale of coke per ton of coal for the first half of this year was 17½ per cent. greater than last year.

Retort-Bench Fittings.

The end buckstays are formed of 16 in. by 6 in. by 62 lbs. steel joists, resting in the concrete of the bench foundations, and tied with 1¾-inch diameter rods with single eyes and flat double connecting links. The side buckstays are formed of 16 in. by 5 in. by 50 lbs. steel joists, tied over the brickwork by 10 in. by 5 in. by 29 lbs. steel joists, attached to the stays with steel gusset brackets. All the buckstays are entirely independent of, and separate from, the stage floor. The furnace and flue walls of the settings are stayed by 8 in. by 4 in. steel joists.

The hydraulic mains are 2 ft. 9 in. wide and 2 ft. 3 in. maximum depth. Steel curved plates, $\frac{5}{16}$-inch thick, form the front and inclined bottom sides. The backs of the mains are formed of $\frac{5}{16}$-inch vertical plates, and the tops are $\frac{7}{16}$-inch flat steel plates. The mains are arranged in six sections at each side of the bench; the divisions being $\frac{3}{8}$-inch steel plates, which also form the webs of brackets resting on the cross joists and supporting the mains.

Near to the centre, each section of hydraulic main is provided with an 8-inch gas-valve, a 4-inch liquor valve, and a 2-inch tar-cock. Both valves close in an upward direction; and either can be used as a seal valve. The liquor valve and the draw-off cock for thick tar are connected to the same special casting. This casting has two outlets, which are connected to a branch casting through which the tar and liquor flow into the tar-main on either side of the retort-bench. A hand-hole is arranged on the tar-main at each branch; and a screwed iron plug is opposite each T branch and in each bend.

A liquor supply-pipe is carried on the top of each hydraulic main; and branches, with regulating cocks, are connected by special syphon visible supply arrangements to the ends of each section of hydraulic main. Fine streams of liquor are constantly flowing into each section of main at both ends; and, owing to the outlet valves being in the centre, the mixed tar and liquor are assisted in moving towards the outlet. A small quantity of tar is run off by each 2-inch tar-cock once each shift; and the 4-inch outlet is thus kept clear of obstruction.

Through these arrangements and the design of the hydraulic mains, &c., although occasionally the heats have been very high, there have not been any stopped pipes which could not be cleared

with ordinary augers from the floor. A reduction in wages expenditure alone of 1·29d. per ton of coal carbonized is effected, besides a greater quantity of gas being made. Two doors to facilitate the clearing of each hydraulic main, should such work become necessary, are on the vertical back plate of each chamber. A small pressure-gauge is connected to one dip-pipe of each setting. These are numbered and arranged in sets, at a convenient level above the floor for observation, at the ends of the retort-bench. Vacuum gauges are also fixed to both ends of the two crude-gas mains.

The cast-iron retort mouthpieces, which project 16 inches from the face of the brickwork, are of the self-sealing eccentric lever type. They are stayed and supported by horizontal steel joists connected to the buckstays. The cast-iron ascension, arch, and dip pipes are all 6 inches diameter and $\frac{7}{16}$-inch thick; and none project beyond the outer flange of the buckstays. Connections are made to the tar and crude-gas mains, at the end of the retort-bench, by which the gas and tar may be conducted to No. 1 section works when desired.

The whole of the retort-bench iron and steelwork and fittings cost £12 5s. 11d. per mouthpiece.

Retort-House Stage Floor.

From the side walls of the retort-house to the machine rails next to the retort-bench, the floor is constructed of cast-iron ribbed plates, $\frac{13}{16}$ inch thick, with planed facing-strips along the sides, which rest upon steel joists. Between the rails mentioned and the coke-conveyors, the floor is formed of $\frac{1}{4}$-inch steel chequer-plates strengthened by angles and bulb tees. The main girders of the floor are 15 in. by 6 in. by 59 lbs. steel joists, each of which is supported at one end on a cast-iron column, the other end resting on a padstone built in the side wall of the retort-house.

Wood packing-pieces are laid between the girders and padstones. The columns are placed comparatively close—being 9 feet centres, permitting lighter sections of joists to be used. The longitudinal joists, which carry only floor plates, are 8 in. by 5 in. by 30 lbs. section; and those supporting the machine rails in addition are 10 in. by 6 in. by 45 lbs. All are securely riveted through angle cleats to the main girders. The floor plates are all $2\frac{1}{2}$ inches clear of the walls; and a cast-iron covering curb is laid over the space, and protects the walls from being damaged by tools, &c. The floor is strong enough to bear the weight of a stock of coal—should hand stoking be required, as was the case during several weeks of the winter before machines were installed.

The weight per square foot area of the complete floor, including columns, is 57 lbs.; and the cost was 5s. 3d. per square foot.

Stage, Bunker, and Steps.

To facilitate the delivery of coal on to the stage floor of the retort-house during the winter previous to the instalment of stoking machinery, and for convenience in the subsequent delivery of bricks, retorts, &c., for maintenance, and also for access to the stage floor from the ground level, stage, bunker, and steps were erected at the north-west entrance of the retort-house. The bunker is under the railway; the floor being 6 ft. 2 in. below the rails, and level with the stage and floor of the retort-house. The structure is built of $\frac{5}{16}$ inch steel chequer-floor plates, riveted with countersunk rivets to steel joists resting upon steel columns. The step stringers are steel channels, and the treads are grooved and perforated iron castings. Similar steps and a smaller platform are erected outside the south-west door of the retort-house.

Coal-Stores.

The stores for coal abut upon the north wall of the retort-house; and the waggons are tipped direct into them from the railway, which is 16 ft. 8 in. above the ground level. The quantity of coal that can be tipped by one man, in one store, without trimming and without the aid of conveyors, is 600 tons. This quantity of coal once tipped, the practice has been to maintain the level of the coal sufficiently high against the wall of the retort-house so that the breakers inside are fed without trimming.

The portion of the railway crossing the stores is covered by a steel roof and galvanized sheeting; the span being 25 feet and the length 99 feet. The remainder of the stores is covered by a roof of similar type in two spans, each 37 ft. by 48 ft. long. The walls are 1 ft. 11 in. thick, panelled to 1 ft. $6\frac{1}{2}$ in. The side walls are strengthened with 9 in. to $4\frac{1}{2}$ in. piers, 2 ft. 9 in. wide and 8 ft. centres. Stones, 4 feet long, are built in the wall at each pier, 10 feet above the ground level; and $2\frac{1}{2}$ in. by $\frac{1}{2}$ in. steel tie-bars suspended from the roof principals stretch from wall to wall, and are attached to the stones with Lewis bolts. The gable walls are strengthened with heavier piers. The side walls are 15 ft. 4 in. high; and the shoes of the roof principals resting on piers are 19 ft. 3 in. above the ground level. The open spaces between the piers and the roof louvre are arranged for light and ventilation. The capacity of the stores is 19 days' maximum demand.

The capital outlay was 2·4d. per cubic foot of storage space.

Coal Machinery.

The coal-breakers are sunk into pits inside the north wall of the retort-house, as already indicated; and the coal "feed" is regulated by steel sliding doors. Two sets of breakers, elevators, and band conveyors are in use for the first half of the retort-house; and a third set will be erected for the second portion. Each set is driven by a 26 brake horse power gas-engine, fitted with a self-starter. The breakers are designed for cannel coal; and each set of machinery is of 10 tons per hour nominal capacity. With ordinary coal, however, when in actual working two 10-ton hoppers, one on each side of the retort-house, are filled in 40 minutes. Thus each set is capable of delivering ordinary coal into the hoppers at the rate of 30 tons per hour. The breaker claws and gearing are of cast steel.

The elevator buckets are of malleable iron, and the detachable link chain is entirely of forged steel. Removable steel slide wearing strips are fitted on the elevator guides. Swivelling doors direct the coal either into the north side hoppers or on to the cross conveyors, which supply the hoppers on the south side of the retort-house. The capacity of the coal machinery is more than double that required to deal with the maximum quantity of coal—thus providing ample reserve. The gas-engines for driving the coal machinery are placed back to back in the same compartment between the pits under the stage floor.

Indicator gear has been specially designed, which enables the attendant, when working the machinery and standing upon the ground floor, to know the exact depth of coal in the hoppers on both sides of the retort-house, without moving from his position by the breakers under the stage floor. Platforms and fixed iron ladders are arranged for easy access to all lubricators in connection with the elevators, conveyors, &c.; and supervision is exercised to ensure efficient lubrication and reasonable cleanliness of this and all other machinery.

Stoking Machinery.

Retort charging and drawing machines, driven by compressed air at a pressure of 65 lbs. per square inch, serve and clear the retorts. These magnificent machines, manufactured by West's Gas Improvement Company, Limited, have continued from the date they were first started—nearly twelve months ago—to work with precision and reliability, and have not disappointed the most sanguine expectations. The retorts can be charged with regular or varying quantities of coal, as required. Coke from the centre retorts for the furnaces is drawn out of the retorts on the north side only. A quantity to make up the amount required is pushed over by the drawing machine on the south side, which is thus made to act as a ram. The incandescent coke is shot directly into the furnaces from the centre retorts by the drawing machine, aided by a movable shoot attached to the machine.

The machines are made to travel along the retort-house by enclosed compressed-air motors. The charging machines, when fully loaded, travel at the rate of 120 feet per minute. Retorts, 22 in. by 16 in. by 20 ft. long, are cleared and recharged at the rate of 80 per hour, or one in 45 seconds. This time is nearly doubled, however, in the case of centre retorts, which are emptied into the furnaces. These rates include travelling time.

The work of the machine men is extremely light, and none of those employed had been previously engaged upon stoking machines, but had been working as ordinary stokers or yard labourers. Alacrity is acquired in working the machines, by men unaccustomed to such work, with surprisingly little practice.

Coke Conveyors and Breaker.

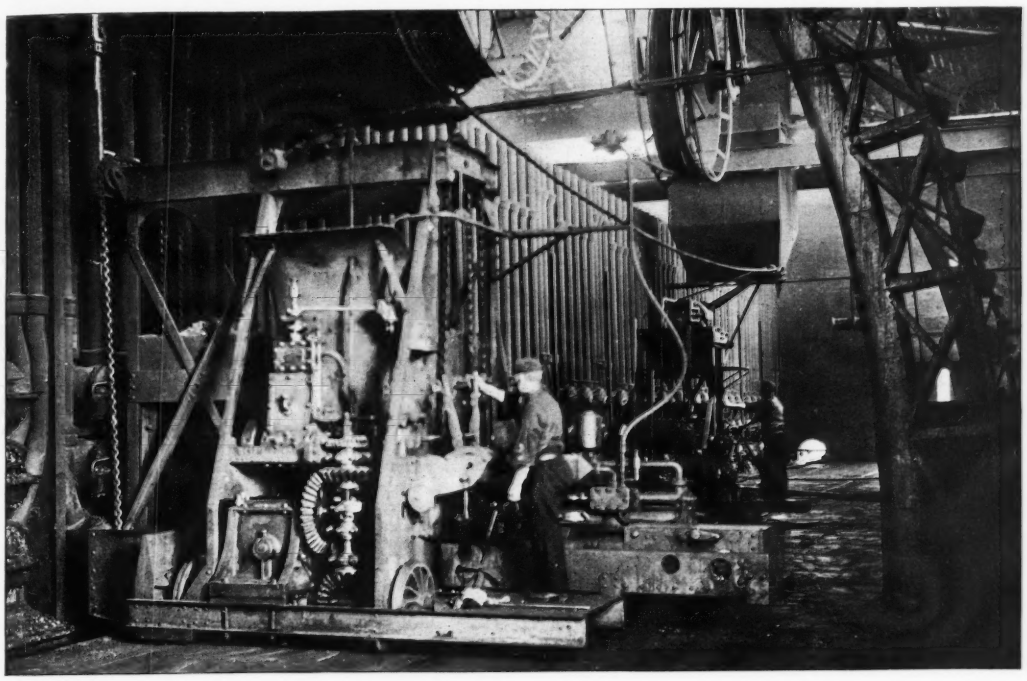
De Brouwer coke-conveyors, manufactured by Messrs. W. J. Jenkins and Co., Limited, of Retford, arranged at the stage floor level in front of the mouthpieces at both sides of the retort-bench, convey the red-hot coke from the drawing machines, pass it under water-sprays outside the west gable wall of the retort-house, and distribute it under the superstructure at any point to a distance of 100 feet outside the retort-house. Curves, having large upward radii, are arranged outside the wall; and the conveyors, inclined from thence at an angle of 1 in 4, rise to a height of 29 feet. The return chains of the conveyors are under the troughs and well out of the way.

Adjustable top angles are fitted at the curves, and sliding doors are spaced 8 feet centres for the distribution of coke along the paths of the conveyors. Coke can also be tipped over the ends of the conveyors. In this way, 400 tons of coke can be stacked outside the retort-house by each conveyor without any trimming. At the end of the south side conveyor, a breaker is so constructed that the coke may be delivered through it and over a fixed screen into the yard below, or directly over the end of the conveyor.

Two gas-engines, each of 33 brake horse power, fitted with self-starters, are in a house between the conveyors. One engine is of sufficient power to drive the conveyor, the breaker, and a contemplated extension of the coke plant. The engine belt drives a countershaft, to which are connected the belts driving the pulleys on the conveyors. Tension gear and differential chain gear is provided. The chains are protected from the coke as it falls from the retorts by steel angles. The chains are lubricated as they leave the tension gear. All the links are of stamped steel, and the pins turned to a driving fit. The weight and wear on the chains are taken by the machined trunnions of the double links, so that the riveted pins have simply to hold the side links in position.

An arrangement has been fitted up which enables any man, while in the retort-house, to stop either conveyor instantaneously. This is useful in the event of any bar or tool getting in the conveyor, or in the case of accident or emergency of any kind. It is simple and absolutely certain in action, and has been used several times—preventing serious breakdown on each occasion. The gear can be so arranged that a man can instantaneously stop either conveyor at any point along the whole length of the retort-house.

As about 50 per cent. of the coke sold is ordered to be broken and screened, nearly all the coke from the south side of the retort-house passes through the breaker. This breaker requires no attention beyond ordinary lubrication; for it deals with the



No. 2 Retort-House and Stoking Machinery.

coke as quickly as it is sent from the retorts. The amount of breeze made by using the breaker is 6·6 per cent., or 1·32 cwt. per ton of coke and breeze passed through. The extra charge made for broken and screened coke is 1s. per ton. After allowance is made for extra breeze, a balance of 3·2d. profit per ton is available for covering wear and tear, &c.

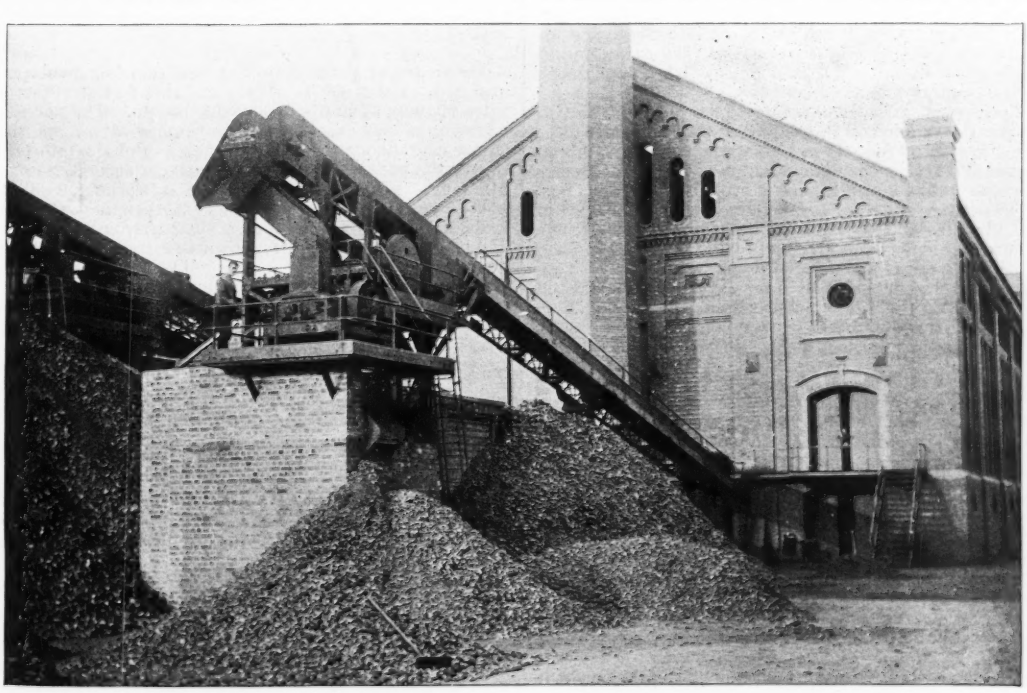
The amount of coke made exceeds the local demand by several thousand tons per annum; and this surplus is despatched by rail for shipment. A steam crane and light iron trolleys are used for filling the railway waggons on the overhead railway, from the stock of coke in the yard, at a cost of 5½d. per ton.

Retort-House Machinery.—Financial Results.

The reduction in wages in the retort-house is 1s. 11·43d. per ton of coal carbonized. This result is for the half year ending June 30 last. The number of settings at work ranged from a maximum of twelve to a minimum of six. The amount of coal carbonized in No. 2 retort-house during the half year was 16,034 tons. Against the above reduction effected are considerable charges, as set forth in the following table.

Details of Charges against Retort-House Machinery.

Title of Charge.	Pence per Ton of Coal Carbonized.		
	Coal and Stoking.	Coke.	Total Machinery.
Gas for engines (1s. per 1000 c. ft.)	0·17	0·18	0·35
Breeze for boilers	0·15	—	0·15
,, (loss on coke owing to extra breeze made)	0·75	0·75	1·50
Oil and cotton waste	0·65	0·32	0·97
Repairs and renewals (partly estimated)	0·75	1·26	2·01
Repairs, wages	1·01	0·50	1·51
Total of above	3·48	3·01	6·49
Interest on capital at 4 per cent., including extra on buildings	1·87	0·84	2·71
Total of all charges.	5·35	3·85	9·20



The New Coke Conveyors and Breakers.

This table shows that the charges are against—

Coal and stoking machinery . . .	5·35d.	per ton of coal.
Coke machinery	3·85	,, ,,
Total	9·20d.	,, ,,

The gross reduction in retort-house wages owing to machinery, as previously mentioned, is 1s. 11·43d. per ton of coal carbonized. This amount is divided as follows:—

Due to coal and stoking machinery	1s. 3·67d.	per ton of coal.
,, coke machinery	os. 7·76	,, ,,
Total	1s. 11·43d.	,, ,,

To obtain the net reduction in working costs, the charges as per table must be deducted; thus—

—	Coal and Stoking.	Coke.	Total Machinery.
Retort-house wages reduction . .	1s. 3·67d.	7·76d.	1s. 11·43d.
All charges, as per table	0 5·35	3·85	9·20
Net reduction per ton of coal carbonized	10·32d.	3·91d.	1s. 2·23d.

The net reduction therefore in manufacturing costs is 1s. 2·23d. per ton of coal carbonized, or 1·35d. per 1000 cubic feet of gas, when 10,500 cubic feet are made per ton of coal.

Owing to there being no stopped pipes, a further reduction (already referred to) of 1·29d. per ton of coal carbonized, has been effected. No allowance has been made in favour of machinery, though an increased make of gas per ton of coal is undoubtedly to some extent attributable to its agency.

The amount of breeze in the mixture of coke and breeze delivered into the yard from the retort-house, including that passing through the coke-breaker, has increased from 12·55 per cent. to 14·70 per cent. The loss due to this increased percentage of breeze has been evenly divided between the stoking and the coke machinery. A coke-breaker was in use before the new section was built; and the comparatively high percentage of breeze is owing to such a large proportion of the coke sold being broken and screened.

The renewal parts of the machinery have been practically *nil* during the ten months of continuous work. This item among the charges has therefore been carefully estimated, and considerable allowance made. Repairs to machine scoops constitute the greater portion of the wages charge against stoking machinery. Repairs to coke machinery have been insignificant; but a set of new blades was fitted in the coke-breaker after about 4000 tons had passed through.

Oil and grease are used somewhat freely in endeavouring to reduce wear and tear as much as possible. The capital charges given in the table are the sums chargeable per ton of coal per annum, assuming that the total amount is only 47,619 tons, which is equivalent to all the 384 mouthpieces producing 6500 cubic feet of gas each for 200 days in the year.

Retort-House Wall Condenser.

The 8-inch branch pipe from each section of hydraulic main is connected to a 12-inch crude-gas main resting upon the cross joists at each side on the top of the retort-bench. These two 12-inch mains are connected at the end of the retort-house to an 18-inch steel trunk main, which is carried along the gable wall to the south side of the house, and then under the stage floor to the centre doorway and back to the gable wall.

The steel primary condenser thus formed has an area of 1·38 square feet per 1000 cubic feet of gas passed through it per day; and the temperature of the gas is reduced to approximately to 90° Fahr. when the atmospheric temperature is 50° Fahr. Before the gas leaves the retort-house, it passes through a tar-screen box, containing 18 slot perforated plates, arranged on similar lines to that designed by Mr. W. Doig Gibb, of Newcastle-on-Tyne. The gas has to traverse devious paths; and by impinging upon each plate and the sharp edges and sides of the slots, it deposits a considerable proportion of the suspended tar. Valves are arranged so that either or both the wall condenser and screen-box can be bye-passed. Both, however, have worked continuously from the date gas was first passed through them—November last.

Annular Air Condenser.

The 18-inch main from the tar-screen box is connected to a 24-inch main at the inlet of the annular air condenser. An 18-inch branch is arranged on the same casting, for the main from the second retort-bench. The 24-inch main is laid in a straight line by the side of the air and water condensers, and can be used as a bye-pass if required. Valves and connections are arranged so that the lines of columns may be used separately or together.

The condenser is reversible, on the principle of that described by Mr. Charles Carpenter, of the South Metropolitan Gas Company, in a paper read by him before the Southern District Association of Gas Engineers in 1895.* It is necessary to alter three valves in this particular design in order to reverse the condenser. The valves are placed conveniently close, and are provided with hand-wheels, so that the reversing operation occupies one man only 8 seconds. The condenser is reversed daily. The average amount of naphthalene in the purified gas distributed (being the result obtained from 24 consecutive tests) has been 5·43 grains per 100 cubic feet of gas since this condenser has been regularly reversed; whereas for several weeks after the works were started, and previous to the reversing operations, the average of several tests gave 15·68 grains per 100 cubic feet.

The tar-pipes are covered with non-conducting composition. The tar flows into the tar-main from the retort-bench and then into the well. Doors and plugs have been arranged wherever required, to facilitate clearing work, should any be necessary. Since the condenser was started in November last, no work has been done upon it except the daily reversing operation. The temperature of the gas as it leaves the condenser is the same as that of the atmosphere. The air surface is 3·72 square feet per 1000 cubic feet per day for the make of gas from the whole house.

The cost of the condenser, including valves and connections, was 2s. per square foot of condensing area.

Tubular Water Condenser.

For use in summer time, condensers composed of inclined tubes, cooled with water outside, are arranged for each half of the retort-house. One of these condensers is erected, and has been in use during the summer. The water inlet is near the gas outlet; and the water is caused to travel the length of the condenser three times before returning to the reservoir. The tubes are provided with bolted glands, to permit of free expansion. The end chambers are closed with removable doors, in order that the tubes may be readily cleaned. The tubular condensing area is equal to 2·1 square foot per 1000 cubic feet of gas per day; and the cost, per square foot, was 2½ times that of the annular condenser.

Total Condensing Area.

The aggregate condensing area of the three types of condensers described and in use is 7·2 square feet per 1000 cubic feet of gas made per day when all retorts are at work.

General Main Connections.

Upon leaving the condensers, the gas enters a common 24-inch main, and is drawn forward by the exhausters connected to the main. From the exhausters, throughout the whole of the purifying plant to the holders, the gas may be dealt with in two sections, which can be kept quite separate. When only one section is required to be at work, the gas made can be passed through any portion of the plant in one section, and through any succeeding portion in the other section.

The mains are laid at suitable inclinations, and drainage pipes are connected at all necessary points. The drainage pipes, which are 4 inches to 6 inches in diameter, all have 48-inch seals in covered cells; thus avoiding any loss of volatile constituents of the drainage liquor. Hand-holes and plugs are arranged on all covers and seal pipes; but since the works were started, neither the seal pipes nor the cells, nor, indeed, pipes of any description, have required any clearing, and none show any sign of accumulation of obstructing material. A small brick drainage well receives the liquor from the purifying plant. The liquor is pumped thence to the storage wells daily. The mains are all laid in straight lines; and where there is a change in the direction of a main, it is always at an angle of 90°. A tee-piece or cross casting, with blank flanges, is invariably used; and there are also door castings in long lines of mains for clearing purposes.

Exhausters.

There are at present two of Waller's four-blade exhausters installed. Each one is of 70,000 cubic feet per hour capacity, when running at 60 revolutions per minute. This allows a surplus capacity in each exhauster, when running at the speed given, of 34 per cent. above the make of each half of the retort-house. A third exhauster will be erected when the second retort-bench is fitted up. When the whole house is working, two exhausters will be running at the same time. The engines are made right and left hand; thus forming a clear avenue between each set. Each engine is fitted with adjustable expansion gear, and a bell governor acting upon a sliding equilibrium valve. A 3-inch gas bye-pass is connected to the inlet and outlet of each exhauster below the floor. A standard, with scale and hand-wheel, is fixed close to the outlet valve of each exhauster; and when it is desired to stop the exhauster, the two valves can be closed simultaneously by one man. Full sets of gas pressure-gauges, vacuum register, also steam pressure gauge and recorder are provided. The engines are protected by brass handrails and standards.

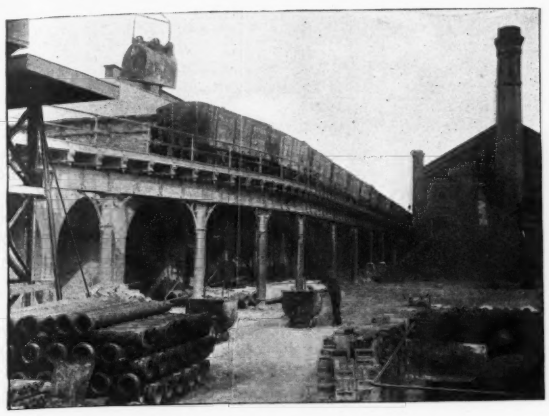
Air Compressors.

The two air compressors are West's and Jenkins patent single-line type; and the steam-engines are right and left hand. Each one will supply all the air required for the stoking machinery at 65 lbs. pressure per square inch. Compressed air is also used for the railway capstan, and for elevating benzol, &c.

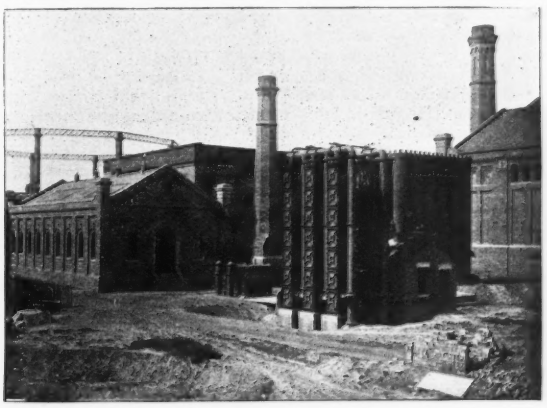
Engine-House.

The engine-house is divided into two portions—one being for the air compressors, and the other for the gas exhausters. In the division wall, reaching to the roof, are windows and glass panelled doors; so that one man can survey both portions of the house from almost any point in either. A doorway in the side wall of the engine-house permits ready access to the boiler-house; and being located close to the gable walls, dust from the boiler-house is prevented from reaching the engines.

* See "JOURNAL," Vol. LXVI., p. 1025.



High-Level Railway.



Scrubbers, Condensers, Engine and Boiler House.

The engine-house is lined with chocolate coloured glazed bricks to a height of 3 ft. 4 in. above the floor, and from that level to the roof with white glazed bricks, except a pattern of chocolate bricks 14 feet above the floor. The compressor engine-house is 37 ft. 7 in. long, and the exhauster engine-house is 32 ft. long. Both are of 33 feet span and 17 feet high to the eaves edge of the roof cleading. The floor is 3 ft. 6 in. above the ground level; and the basement is sunk to a depth of 4 feet. The basement floor is of concrete; and a man can walk upright upon it. All the pipes in the basement are in full view.

The floor of the engine-house is formed of concrete and steel joists, overlaid with pattern tiles. Ventilation grates are arranged in pattern in certain positions. Where the pipes pass through the floor are grates cast in halves, each with a semi-circular hole at one side; and the pipes pass through the holes formed by the semi-circles placed together. The grates and pipes can be removed without disturbing the floor. Manholes with steel covers are arranged under the door mats. The basement may also be entered by small windows in the east gable. The steel joists are supported by the walls of the house and the engine foundations; and by the arrangement of joists only one column was needed.

The exhauster engine-house is sufficiently large for the accommodation of two small exhausters for carburetted water gas, besides the three coal-gas exhausters. In addition to the windows in the walls, two skylights of rough cast plate glass are arranged on each side of the roof, and have an area of 560 square feet. The glass sheets, each of which is 7 ft. 6 in. long, are laid upon grooved steel tee-bars; and the joints are covered with copper caps with brass bolts. Asbestos cord is used to ensure water-tight joints. The roof cleading is of grooved and tongued bevel jointed red-pine boards, laid longitudinally along the engine-house, and nailed to battens bolted to the steel principals. All the roof woodwork is planed, stained, and varnished.

The roof principals are formed of steel bars and plates with arched main ties. The large gusset plates are ornamented with cast-iron scrolls, and the bars and plates are painted in harmonious colours. The principals rest in the walls, and also upon ornamental springer padstones. There are four 18-inch Boyle ventilators along the roof ridge; and all the semi-circular tops of the windows are hinged and adjustable. The engine-house is thus thoroughly ventilated, and made as healthy as possible for the men engaged in it. The lighting at night is effected by two Lucas and four Welsbach self-intensifying incandescent gas-burners. The total light is 2600-candle power, and costs the Company 0·34d. (say $\frac{1}{3}$d.) per 1000 candles per hour, with gas taken at 1s. per 1000 cubic feet.

Boiler-House.

The boiler-house annexed to the engine-house, is designed to contain three Lancashire boilers, each 7 ft. 6 in. in diameter and 28 feet long; also the water-tank pumps, boiler-feed pumps, and feed-water heater. The walls are 2 ft. 9 in. and 2 ft. 4 in. thick, panelled to 1 ft. 11 in. thick, built to a height of 34 feet, and surmounted by a tank, which covers the whole house. Iron bonding strips are built in the walls. Two boilers are in position, one of which supplies the steam required for all the plant in connection with the whole of the retort-house. The third boiler will not be built until carburetted water gas is installed. The doorway of the house is made so that any boiler can be placed in position or removed without disturbing the brickwork around the others, or the wall of the building. Windows, inclined inwards, form ventilators and, together with perforated bricks under the stone coping, ensure constant change of air.

The engine and boiler houses together cost 5·83d. per cubic foot of space enclosed, from the basement to the roof apex of the engine-house and from the ground to the tank over the boiler-house.

Boiler-Seatings and Chimney.

The boiler-seatings are lined throughout with fire-bricks. Seating and flue bricks are used where required. The arch at the back of the boiler does not receive any support from the boiler end (a heavy tee-bar being used for this purpose), and the boiler is free to expand without injury to the arch. The fronts of the seatings are faced with glazed bricks and stone coping. A covered air space for expansion is left between the boiler seatings.

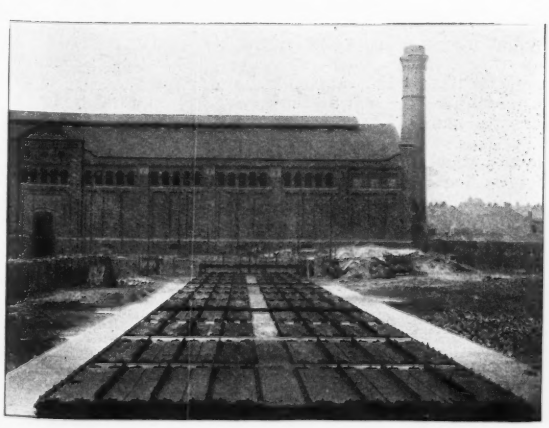
The boiler seatings, with the main flue to the chimney, cost £2 4s. 5d. per square foot of grate area.

The chimney for the boilers is 60 feet in height and 3 ft. 9 in. diameter (octagon) at the top, which is equal to one-seventh of the total grate area of the two boilers. The brickwork is 1 ft. 6$\frac{1}{2}$ in. thick at the base and 9 inches at the top; and there is a 4$\frac{1}{2}$ inch fire-brick lining to a height of 24 feet. The red brickwork is built in cement mortar, and the stone coping and cap stones are bonded with iron dowels. The lightning conductor projects 6 feet above the chimney.

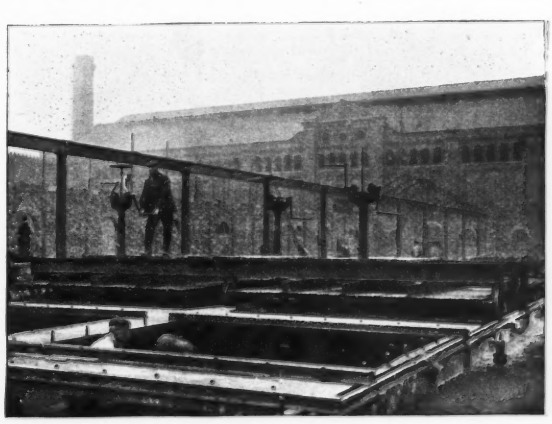
The cost of the chimney complete, with the flue to the inside of the building, amounted to £3 per foot of height, or £2 10s. per square foot of grate area served.

Tanks over the Boiler-House.

The Company possess a private supply of hard water and a small reservoir. The water-storage capacity has been largely



Purifiers, and Side of Retort-House.



Hovey's Patent Purifier Cover Crane.

increased by a tank, divided into three portions, fixed over the boiler-house. Two of these sections are used respectively for hard and softened water; and they have a total capacity of 68,000 gallons. Water may be run from one into the other, if required, by opening a 3-inch valve in the division plate. The third section is for ammoniacal liquor, and has a capacity of 11,000 gallons. The floor plates of the tanks are laid upon 10 in. by 5 in. by 35 lb. steel joists resting on steel plate girders 34 ft. 6 in. span, 3 ft. deep, and 9 ft. 3 in. centres. The cast-iron tank plates are $\frac{3}{4}$-inch thick. The ribbed flanges are $\frac{7}{8}$-inch thick; and the joints have planed strips $\frac{3}{4}$-inch wide, $\frac{3}{16}$-inch high and $\frac{3}{4}$-inch bolts, 6-inch centres. Rust joints are made above the planed strips.

When the tanks are full, there is a little over 50 tons weight on each main girder. The supply, overflow, and discharge pipes are all inside the boiler-house; and the two former are carried to within 6 inches of the top of each tank. Level indicators are in the boiler-house; and special float and cut-off plugs are arranged so that in the event of a discharge pipe bursting, or should leakage occur anywhere on the lines of discharge pipes, the end of the discharge pipe inside any tank may be immediately closed by a man on the ground floor of the boiler-house. Valves are also arranged on the lines of pipes inside the boiler-house.

The cost of the tank, including girders, joists, pipes, valves, and indicator gear was £13 12s. 5d. per 1000 gallons storage.

Boilers.

Each of the two boilers is 7 ft. 6 in. diameter, and 28 ft. long, and works at a pressure of 100 lbs. per square inch—the hydraulic test pressure being 180 lbs. per square inch. The shell is composed of five rings of $\frac{9}{16}$-inch steel plates, each ring being made of one plate. The boiler end-plates are $\frac{11}{16}$-inch thick. All joints are double riveted with $\frac{7}{8}$-inch rivets; and the longitudinal seams have internal and external butt strips. The flue plates are $\frac{7}{16}$-inch thick, except the first two rings containing the grates, which are $\frac{1}{2}$-inch thick. The flue joints are of the flanged plate and bar ring type. All the rivets, where possible, were closed by machines, and all holes were drilled.

The mountings are all of the highest class. There is on each boiler a high-steam and low-water alarm safety-valve, and a duplex spring and dead-weight safety-valve. A fusible low-water plug is screwed in the crown of the furnace plate of each flue. The stop-valve on each boiler is 6 inches diameter. Check feed-valves are connected to internal distributing pipes on each side of each boiler. Sludge and isolating valves are fitted to cast-steel pipe bends on each boiler. All the saddles are of forged steel. The furnaces have forced-draught fittings; and only fine coke breeze—sale price, 1s. 6d. per ton—is used for fuel.

The cost of the boilers, including the forced-draught furnaces and all mountings, was £13 4s. 5d. per square foot of grate area.

Steam and Water Connections, Etc.

The main lines of steam-pipes are from 6 inches to 2 inches diameter; and all straight lengths and bends are of steel or wrought iron. The main lines of pipes are arranged on the belt principle, 4 ft. 9 in. above the branch on the boiler stop-valve. All stop-valves, beyond the boilers, are of the parallel clear-way type, and are fixed in inverted positions. The bends are struck to large radii, and all cast-iron tee-pieces are strongly ribbed. All joints are made with corrugated brass washers, coated with suitable cement. No expansion-joints are used, as the pipes are free to expand in any direction from the boilers, and no joint on any of the main lines of pipe has been re-made.

The exhaust steam-pipes are carried under the engine-house floor; and these, with all pressure steam-pipes, are covered with non-conducting material. The exhaust steam-pipes from the engines are connected to a common 7-inch main, which conducts the exhaust steam to a feed-water heater. A bye-pass is arranged so that the steam may pass direct to the atmosphere if required. The feed heater has a syphon bottom, which would act as a safety bye-pass in the event of the brass tubes through which the steam passes, causing any serious back-pressure. The tubes present a heating surface of $\frac{1}{6}$ square foot per gallon of water used per hour when the nominal amount of 700 gallons of water is being used. The feed water is raised to 185° Fahr., and thus enters the boilers almost boiling. The feed-heater is situated between the pumps and the boilers, and a water bye-pass is fitted to it. The cost of the feed-heater was £1 13s. 7d. per square foot of grate area served. The present saving in fuel is 18 cwt. per day. This amount will be more than doubled when the heater is doing maximum duty.

Relief and other valves are fixed on the feed-pipes. The boiler feed and overhead tank pumps are all in duplicate, and are of the double vertical ram type, with central fly-wheel. Each of the boiler-feed pumps has a capacity of 1240 gallons per hour at 60 revolutions per minute, and will serve two boilers.

The overhead-tank pumps have each a capacity of 2400 gallons per hour at 60 revolutions; and they supply all the hard water for use in connection with the retort-house, the tubular condenser, and for general purposes. They are also connected to the boiler-feed pipes, and could be immediately used in case of emergency. The pumps are also arranged so that fire extinguishing hose can be readily attached to the delivery pipes, and could be speeded to deliver, to any height that might be required, a total amount of 10,000 gallons of water per hour.

Water Softener.

The water from the Company's private source is generally of a very hard nature, though it varies considerably. It is softened in an automatic apparatus, of 1000 gallons per hour capacity, from an average of 32° to 10° of hardness, at a cost, including labour, of 2d. to 3d. per 1000 gallons, depending upon the quantities of the reagents required. The reagents used are lime and soda in solution.

Washer.

A Livesey type of washer, 10 ft. by 7 ft. 6 in. by 3 ft. 6 in. deep, of 1½ million cubic feet per day nominal capacity, eliminates any trace of tar that is in the gas when passed into it. A similar washer will be erected at the same time as the second retort-bench. The liquor entering the washer is directed against the sight glasses; thus keeping them clean. Inlet, outlet, and bye-pass valves are connected.

Scrubbers.

The scrubbers are designed on similar lines to those described by Mr. Charles Carpenter, in the paper he read before the Gas Section of the Engineering Congress at Glasgow in 1901.* Three scrubbers are in use at the same time; and the wetted surface is considerably greater than the original scrubbers mentioned. The increased surface was provided in order to be on the safe side in working this new design of scrubber. Experiment has, however, been made with two scrubbers—the first being bye-passed. The area of wetted surface then amounted to 26·4 square feet per 1000 cubic feet during the maximum make of gas per day. This has been found sufficient to abstract the whole of the ammonia and work the liquor up to 10-oz. strength. This surface, though only about one-tenth of that in ordinary scrubbers, is yet double that allowed in the scrubbers at the Bankside works of the South Metropolitan Gas Company. Not the slightest trace of ammonia passes these efficient, though diminutive and cheap, scrubbers.

There are at present two sections, each of three scrubbers; and a third section will be erected with the second retort-bench. One section will always be kept in reserve; so that either of the other sections may be cleaned at any time. The scrubbers are each 2 ft. 6½ in. square, 28 feet high inside, and contain 72 bundles—each bundle being of 61 iron plates, 2 ft. 6 in. long, 9 in. deep, and No. 20 B.W.G. thick. The plates are vertical. The spaces between them are maintained by iron washers $\frac{5}{8}$ inch thick; and four $\frac{5}{8}$ inch rivets pass through 61 plates, forming one bundle. The flat rivet-heads are arranged so that they are not opposite each other in adjacent bundles—thus avoiding wide spaces.

Each succeeding layer of bundles is placed with the plates across those of the layer below, which divides the gas passage area of 3½ square feet into 33,000 meshes—thus splitting the gas into an enormous number of streams. The body of each scrubber is built of $\frac{5}{8}$-inch cast-iron plates—those on one side being removable. Three platforms are arranged, so that the bundles may be quickly taken out and replaced when required. It has been found necessary to steam or clean the bundles in each scrubber after it has been working two to three months. The cost of removing the bundles, cleaning them equal to new, replacing them, and closing the plates is £2 per scrubber. The water and liquor are pumped into the scrubbers, striking against the 2½-inch diameter horizontal plate-glass discs at high speed—ensuring thorough distribution. The levels of the discs are adjustable.

A tank, divided into two compartments, is used in connection with the working up of the liquor by the pumps. The liquor-pumps are of the double vertical ram type. The sides of each pump are separated by a diaphragm, so that one side is pumping strong liquor into the first scrubber, while the other ram pumps weak liquor into the second scrubber. The pumps are in duplicate; and each set, running at 60 revolutions a minute, will deliver 18 gallons of liquor through the scrubbers per 1000 cubic feet of gas during the maximum make. Each of the two water pumps—one of which is in reserve—has one ram, and delivers, when running at 60 revolutions, 2·88 gallons of water per minute. As considerably less than half this quantity of water is at present required, a bye-pass is fitted, so that the amount of water pumped into the scrubber may be reduced to a very small stream while the pump is travelling at a reasonable speed. A measuring apparatus is connected to the water bye-pass, so that the amount returning to the suction tank may be ascertained. The liquor outlet pipes at the bases of the scrubbers are separately sealed in closed vessels; and all drain pipes are of large diameter. Sulphate of ammonia is made in No. 1 section works from the liquor.

The capital outlay upon the whole of the washing and scrubbing plant, including tanks, pumps, and pump-house, valves, and immediate connections, is 1·37d. per 1000 cubic feet of gas passed per annum. The increase in the amount of sulphate of ammonia during the first half of this year was 1·1 lbs. per ton of coal carbonized.

Tar and Liquor Wells and Pumps.

A small tar and liquor well, of 13,000 gallons total capacity, has been built at a cost of £11 per 1000 gallons of storage. The tar and liquor together are pumped into the wells of No. 1 section works by direct-acting plunger pumps, situated in the scrubber pump-house previously referred to. Each of the pumps—one of which is in reserve—is capable of delivering 6000 gallons of tar per hour. They will ultimately be used for filling the railway tar

* See "JOURNAL," Vol. LXXVIII., p. 1306.

Analysis Table of Costs of Plant (Exclusive of Gasholders and Land) for Gas-Works of 2½ Million Cubic Feet per Day, or 500 Million Cubic Feet per Annum of 200 Full Working Days.

Portion of Plant.	Expenditure on Complete Works.	Expenditure per Mouthpiece (384).	Expenditure per Ton of Coal Carbonized per Annum (200 Days).	Expenditure per 1000 Cubic Feet of Gas Made for Working Year (200 Days) per Annum.	Capital Charges per Annum per 1000 Cubic Feet of Gas Made at 4 per Cent.
	£ s. d.	£ s. d.	s. d.	s. d.	d.
Boundary wall	1,232 2 7	3 4 2·08	0 6·21	0 0·59	0·0236
High-level railway, capstan, and heads	3,589 18 3	9 6 11·70	1 6·09	0 1·72	0·0688
Coal-stores	1,674 11 8	4 7 2·61	0 8·44	0 0·80	0·0320
Retort-house building, roof, doors, stage floor, stage, and steps	13,378 5 5	34 16 9·42	5 7·43	0 6·42	0·2568
Chimneys, retort-bench, foundations, and brickwork, 24 settings and fittings	15,458 3 11	40 5 1·37	6 5·91	0 7·42	0·2968
Coal, coke, and stoking machinery (spare parts), and gas-engine house	11,657 18 11	30 7 2·22	4 10·76	0 5·60	0·2240
Engine and boiler houses, engine foundations, boiler seatings, and chimney	3,503 9 4	9 2 5·67	1 5·66	0 1·68	0·0672
Water and liquor overhead storage tanks, girders, pumps, and connections	1,221 12 0	3 3 7·50	0 6·16	0 0·59	0·0236
Water softener and tank	176 10 0	0 9 2·31	0 0·89	0 0·08	0·0032
Two boilers, feed pumps and heater, steam and exhaust pipes, valves and covering, separators and traps	1,785 5 4	4 12 11·79	0 8·99	0 0·86	0·0344
Three exhausters, governors, &c., engine handrails, gas supply meters, lamps, pressure-gauges and requisites and details	1,208 4 10	3 2 11·15	0 6·09	0 0·58	0·0232
Condensers and connections	2,305 0 0	6 0 0·63	0 11·62	0 1·11	0·0444
Washers, scrubbers, tanks, pumps and connections, and pump-house	2,862 13 2	7 9 1·16	1 2·43	0 1·37	0·0548
Tar and liquor wells, pumps, and house	1,679 13 2	4 7 5·78	0 8·47	0 0·80	0·0320
Twelve purifiers with foundations, and cranes and house	10,214 11 0	26 12 0·09	4 3·48	0 4·90	0·1960
Sundry foundations, retaining walls, and drainage connections	452 10 5	1 3 6·83	0 2·28	0 0·22	0·0088
General gas, tar, liquor, and water pipes and valves, including retort-house, condenser, and screen box, and connections to old works	2,810 2 3	7 6 4·32	1 2·16	0 1·34	0·0536
Station meters and governors	2,000 0 0	5 4 2·00	0 10·08	0 0·98	0·0392
Enriching plant and house	300 0 0	0 15 7·50	0 1·51	0 0·15	0·0060
Workshops and machinery	1,800 0 0	4 13 9·00	0 9·07	0 0·86	0·0344
Total of above plant	79,310 12 3	206 10 9·13	33 3·73	3 2·07	1·5228

tank waggons besides ordinary pumping operations. Two liquor wells, each of 30 feet diameter, will be built in the near future.

Purifiers and Details.

The purifiers at present dealing with the gas from the first half of the retort-house are six in number, each 26 feet square, 5 feet deep inside, and containing three tiers of grids. The steel covers are of the flat type, with rubber joints, and secured with slot bolts and cotters. All the pipe and valve connections, which are below the floor, are on the sides of the cast-iron boxes, the tops of which are 1 ft. 7 in. above the floor level. The cost of the excavations and foundations was therefore comparatively small. The inlet and outlet directing chambers on the sides of the purifiers are all rectangular. Separate valves are bolted to the outside of the plates; and all avenues are clear for the removal of purifying material in hand barrows. Efficient indicators are on all the valves, showing at a glance whether they are open or shut. No machinery is employed in connection with the movement of purifying material. The gas passage area is 0·54 square foot, and the grid area 9·75 square feet per 1000 cubic feet of gas made per day when the retort-house is in full working order. The respective areas in No. 1 section are 0·38 square foot and 4·96 square feet. The reduction in the cost of purification is 9·3 per cent. The cost of the purifiers and connections, cover-crane, foundations, retaining wall, and wood floor at the sides and between the purifiers was 5s. 5½d. per square foot of grid area.

Purifier-Cover Crane.

A crane has been designed for lifting each cover at four points; and either one or two covers can be lifted at the same time. Each of the four lifting chains for each cover is vertical and separate. Uneven lifting is, therefore, avoided; and there is practically no swing when the covers are lifted or lowered. A quick lowering motion is fitted; but it is impossible for the handle of the crane to be turned by the weight of the cover, and the cover cannot descend at an undue speed. There are no brakes or ratchet-and-pawl gearing. One man can lift each cover separately, and travel the crane carrying two covers. No superstructure is required, and the necessary head-room is small. The total height of the crane is 7 feet; and the platform upon which the workman stands is 2 ft. 6 in. above the top flange of the purifier. The cost of the crane was comparatively low.

Purifier-House.

A house has been built covering the first section of the purifiers and revivifying floor, and enclosing them on three sides. When the second section is erected, the house will be completed. It will then consist of four roofs, each of 28 ft. span, supported on columns and the side walls. The 14-inch walls of the house are panelled to 9 inches thickness, and have internal piers 7 ft. 3 in. centres. Semi-circular grated windows for ventilation are in alternate panels, and doorways are located where required. A glass covered louvre-type ventilator, 7 ft. 8 in. wide, extends for a length of 174 feet on each roof. The rough-cast plate-glass sheets, each 5 feet long, 2 feet wide, and ¼ inch thick, are firmly secured by lead capping and copper clips and stops. The patent glazing bars are sheathed in lead. The remainder of each roof is covered with Countess slates laid upon steel purlins, and secured with lead hook nails, four of which pass through each slate. The steel roof principles are designed in the most inexpensive formation, and there is no smithwork upon them. The height to the principal shoes is 11 ft. 6 in. from the ground line.

The cost of the purifier-house, with the roofs complete, was 3s. per square foot of grid area, or 2⅞d. per cubic foot of space to the roof apices.

Meter and Meter-House.

A meter of 70,000 cubic feet per hour capacity is at present used for the plant erected. It is located in No. 1 section works, where it has been in use several years in conjunction with, or separate from, a meter of 45,000 cubic feet per hour capacity. The cost of the meter, valves, connections, and house complete was £17 per 1000 cubic feet per hour capacity. The roof was designed without main ties or struts. Additional separate meters are to be erected for the two sections of the new works.

Enriching Plant.

A benzol enriching plant is in daily use for raising the candle power of all the gas as it leaves the holders. The average increase of illuminating power is 1¾ candles, costing 0·43d. per candle per 1000 cubic feet of gas enriched.

Gasholders.

There are at present three gasholders, having a total capacity of 1,350,000 cubic feet, which is equal to three-quarters of the maximum consumption yet reached in one day. One holder has been enlarged by a third lift rising above the guide-framing, which was strengthened to withstand the additional stress from wind pressure. Other holders will be erected when necessary.

Governors.

Gas governors have not been installed in the new works; but there is one 24-inch and one 9-inch on the outlet mains from the holders, and one 14-inch governor is in use at a station in the town. These governors serve present requirements; and an abundant and almost uniform pressure is maintained throughout the district.

Workshops.

The fitters, plumbers, and labourers engaged upon the main and service laying and fitting up of slot-meter installations are despatched from the works with fittings and materials. As the main pipes have been greatly extended, and about 7000 slot meter installations have been fitted up during the last four years, workshops for fitters, plumbers, smiths, and joiners, with commodious stores for materials, have been erected; and they are found indispensable for the economical and efficient carrying on of the work. As all repairs to engines, machinery, and plant generally are executed by the Company's own workmen, the necessary machine tools are provided. These are driven by a gas-engine.

Notes on the Analysis Table of Costs of Plant.

In obtaining the costs of the whole works, there are instances where the first half only of the plant has been completed. The costs of the second section are taken as being equal to similar portions of the completed section. One working year is taken as being equal to 200 days of twenty-four hours each at ordinary practical working capacity. The coal carbonized per retort mouthpiece is the modest weight of 3·1 cwt. per charge, yielding 6500 cubic feet of gas per day, or 10,500 cubic feet per ton of coal. These amounts have all been exceeded in actual working. If the quantity of coal per mouthpiece per charge be increased to 3½ cwt.—*i.e.*, by 13 per cent.—then the capital charges given in the table would be reduced by 11½ per cent. The capital charges are the amounts payable at 4 per cent. upon the actual expenditure, on the respective portions of the works, per annum (365 days). Notice is directed to the total of the last column, which is 1·58d. (say 1½d.) payable in interest or dividends per 1000 cubic feet of gas made, under ordinary working conditions, upon the capital outlay on the whole of the works, except land and gas storage.

General Remarks.

The buildings and structural work throughout have been designed to withstand the severe storms experienced on the North-East coast. Several severe storms have occurred since the new works commenced manufacturing gas; but there has been no expenditure upon the works owing to such visitations. The margin of safety allowed, especially for details subject to shock or to varying load, is in many instances somewhat higher than usual; and everything, whether exposed to view or hidden therefrom, has been carefully made and well finished. Gas manufacture was stopped for twenty-four hours, after eight months continuous process, on the occasion of the workmen's annual excursion; but no man was retained to carry out any repairs.

In this description of the recent extensions at the Tynemouth Gas-Works, the names of contractors have not been mentioned, except when special engines and machinery have been supplied. There have been over ninety contracts, distributed among about fifty firms. The name of the contracting firm for any portion of the works will be furnished if desired.

In connection with almost all contracts, full working drawings, specifications, and quantities have been supplied to contractors; and sun-prints of the drawings were sent with the invitations for tenders. Thus full particulars were placed before the contractors, enabling them to tender for the buildings and plant to be constructed precisely as required. This procedure has resulted in some remarkably close and satisfactory tendering. No allowances were made in the schedules for emergencies or unforeseen work; but the total of these, including extra foundations (all paid for at schedule rates), was 1·37 (say 1⅜) per cent. on the contracts. This percentage is included in the table of costs. The whole of the materials and workmanship are of the highest grade; and the contracts have been faithfully completed, except that the time-limit has been exceeded in several instances.

Conclusion.

This description of the extensions at the Tynemouth Gas-Works, has necessarily been superficial, owing to the limited time allowed for reciting it; but it would be unpardonably imperfect without an expression of my appreciation of the kind consideration extended to me by my chief, Mr. William Hardie, Assoc.M.Inst.C.E., a Past-President of this Association, and by the Chairman (Mr. J. B. Williamson) and the Directors of the Tynemouth Gas Company, whom I have the honour and pleasure of serving.

At the close of the reading of the paper, which was illustrated by some seventy plans and photographs, exhibited by means of lantern-slides as well as by the originals placed round the walls of the meeting room,

The PRESIDENT (Mr. F. P. Tarratt) thought the members would all agree that they were much indebted to Mr. Hovey for the very excellent paper he had given them. It was most elaborate in detail, and the photographs he had shown upon the screen had been taken, he understood, by himself, and must have involved a great deal of labour in preparing. He was sure the author had added greatly, as a contributor, to the transactions of the Association. He only hoped that the drawings which had been so carefully prepared would be printed with the Transactions. He was not sure on this point, but he certainly thought the paper was an invaluable one for reference. He thought he had Mr. Hovey's permission to say that it was almost impossible, with such short time before them, to adequately discuss such a paper. It would not be fair, to the author alone, to just have a short discussion upon such an important subject; and he thought they could not do better than, with the author's permission, postpone the discussion to their spring meeting. He only hoped that the members of the Association would take the opportunity of going carefully into the paper, and would come prepared to put to Mr. Hovey what questions they possibly could. The author had placed the facts before them, and he had no doubt he would be prepared to give satisfactory answers to any questions which might be asked of him.

Mr. W. DOIG GIBB (Newcastle) said that when he first heard that Mr. Hovey had promised to give a paper he knew that they might look forward with confidence to their getting something exceptionally good; and when he heard that the subject of the paper was to be a description of the recent extensions at Tynemouth, he knew that not only would he give the subject-matter in good form, but that the subject itself was well worthy of their closest attention. He had himself had an opportunity of inspecting the works; and he could assure them that, excellent as the photographs and drawings were, they did not adequately convey any idea of the fine works and the splendid manner in which they had been laid out. That they had been carefully designed he thought was shown by the evidence that they were started right away, and for a long time had been running without a hitch. The method of giving a paper with the aid of the lantern was unique, and he thought they might flatter themselves that they were probably the pioneers in giving papers in this form. The communication was long, certainly; and he thought it was best to postpone the discussion of it. But it had one feature which he must remark upon before sitting down, which was that too many of the papers given at technical associations contained a lot of general statements, and not nearly sufficient figures and accurate information to help other engineers when they had similar work to do. The paper that day was all they could desire in this respect; and he congratulated Mr. Hovey, and through him Mr. Hardie, his chief, on the excellent paper and on the splendid works which it described. He moved that they give their best thanks to Mr. Hovey for his paper.

Mr. C. DRU DRURY (Sunderland) seconded. He was sure they would all agree with him that the paper had been presented to them in a most admirable and exhaustive manner, and that the unique method in which it had been put before them had also their appreciation. He had had the opportunity, personally, of inspecting these very fine works; and he must say that they were well worthy of a visit from any of them, and fully carried out all that they had seen and heard described.

The motion having been agreed to,

Mr. HOVEY thanked the members very much for the way in which they had received the vote of thanks which had been so kindly accorded him. It had given him great pleasure and instruction to prepare the paper; and if it had conferred any benefit on the Association, he should be fully repaid for any efforts he had put forward. But whether it had conferred benefit on the Association or not, it had conferred a benefit on himself, in the fact of having to get everything in thorough order, so that it might be described in an intelligent manner. The discussion, as the President had said, was postponed; and when the opportunity occurred for the discussion, he should be prepared to meet with any who might have questions to ask upon it. In any case, the drawings would be there for reference, and, if the President desired it, the lantern would be there also, so that the members would be able to point out any detail they might desire to have further information about. He thanked them for their attention to his long and perhaps somewhat prosy paper.

Gas-Engines for the St. Louis Exhibition.—According to the current issue of "Cassier's Magazine," very large gas-engines will be among the most directly interesting features of the power plant exhibit at the St. Louis Exposition next year. The gas-engine group will contain, to begin with, the largest gas-engine in the world available for service by the spring. It will develop 3000-horse power, and will come from the works of the John Cockerill Company, of Seraing. It will have a length over all of 67 feet, and an extreme breadth outside the dynamo of 21 feet. It will be of the horizontal two-cylinder type, each cylinder being 51 inches in diameter with a stroke of 55 inches. The fly-wheel will have a diameter of 26 feet; and when the engine is developing 3000-horse power, the revolutions will be 85 per minute. The extreme length of the bed-plate proper will be 77 feet. The firm of A. Borsig, of Tegel, near Berlin, will send a 1750-horse power Oschelhauser gas-engine; and the firm of Julius Pintsch will supply the gas-producer for it, which will be of sufficient capacity to furnish 2400-horse power. The celebrated gas-engine factory at Deutz, near Cologne, will contribute to the power plant a 900-horse power gas-engine; and the Allis-Chalmers Company, of Chicago, propose to put up an 1800-horse power horizontal two-cylinder engine of the Augsberg-Nuremberg type. This engine will measure 60 feet over all, with an extreme width to the outside of the dynamo of 19 feet. The fly-wheel will be 16 feet in diameter, and when developing 1800-horse power the engine will run up to 92 revolutions per minute.

THE EITLE RETORT-CHARGING MACHINES.

The following is a translation made from "Het Gas" of a communication presented to the meeting of Dutch Gas Engineers at Haarlem in July last, by Herr W. Mast, the Chief Engineer of the firm of C. Eitle, of Stuttgart. It was apposite to a question on the programme of subjects for discussion at the meeting—as to what experience had been gained with Eitle's bi-partite scoop charging apparatus. The communication also deals with a newer rotatory projecting type of charging machine.

The mechanical charging of retorts has latterly come so much to the front that a question on the subject was certain to be on the programme of a gathering such as that of the Dutch gas engineers. The application of inclined retorts goes, as is well known, together with mechanical appliances for the transport of coal and coke. When settings are built with inclined retorts, considerable expenditure has to be incurred in the retort-house. It is, however, more and more apparent that the capital expended in this manner yields important advantages; and therefore in a number of large gas-works, inclined retorts and mechanical appliances appertaining thereto, have been introduced.

Those gas-works which have not a large capital are content with settings of horizontal retorts; and for some time efforts have been directed towards the construction of apparatus for mechanically charging and drawing these retorts. There are numerous types of apparatus for the purpose; but only a few appear to be serviceable and so have found permanent application.

An apparatus constructed a few years ago by the firm of Eitle, of Stuttgart, is shown in the accompanying drawing (fig. 1). This

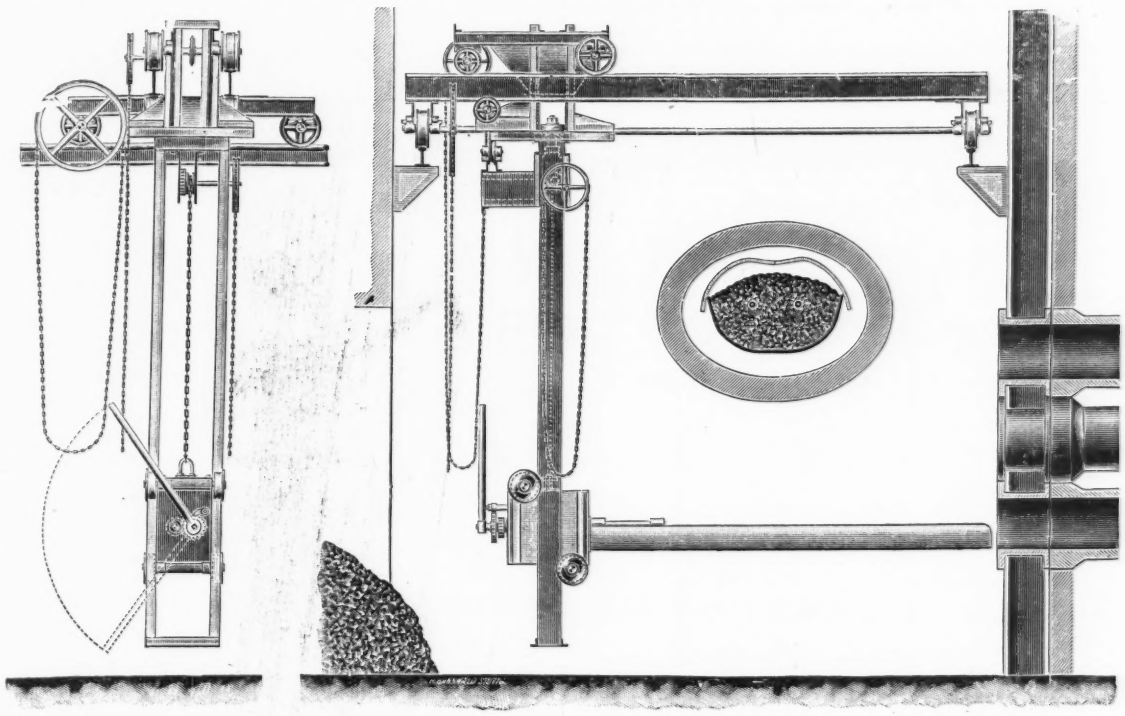


FIG. 1.—THE "EITLE" RETORT-CHARGING MACHINE.

apparatus fully achieves its object—viz., the charging of horizontal retorts perfectly. Two rails, on which a crane runs, are fixed along the entire length of the retort-house. The scoop for filling the retort is supported from one end, and can be moved up and down, and be pushed in a horizontal direction into the retort, as well as turned about its vertical axis. The shape of the scoop, which consists of two parts, corresponds with the section of the retort. As soon as the full scoop is pushed into the retort

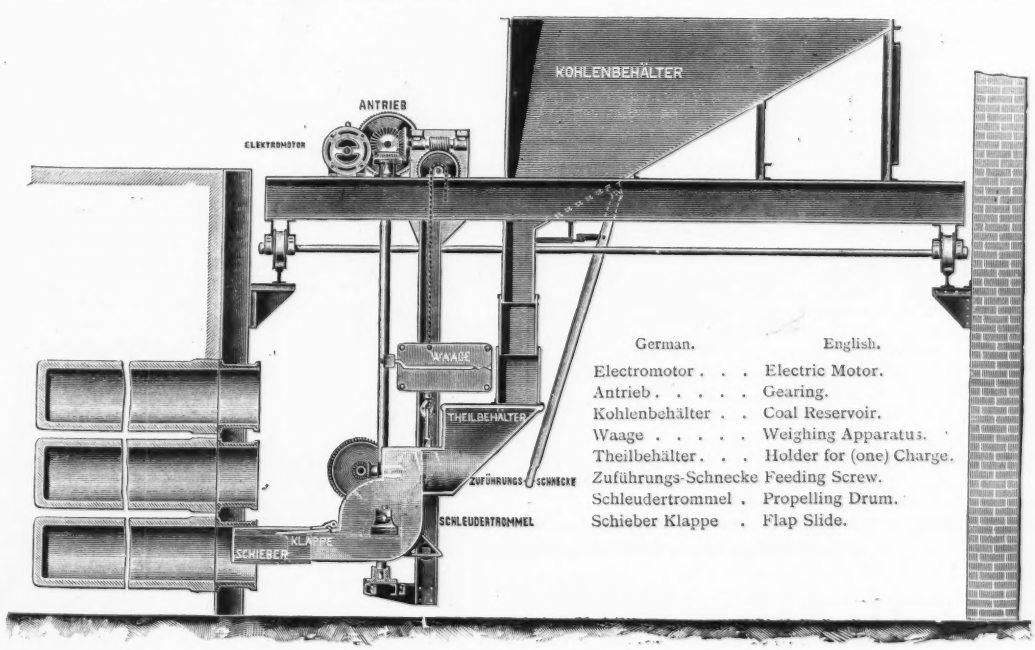


FIG. 2.—THE "KOBOLD" RETORT-CHARGER.

the two halves of the scoop are turned over, by means of a lever, until they strike together, above the coal, when they are drawn out over it. The scoop is then closed again, turned till it lies parallel with the face of the setting, filled, turned back, and pushed into the next retort. These movements can be made by hand, by means of chains, or the apparatus can be connected with an electro-motor. The manipulation is so extremely simple, that after a little practice, any workman can handle the apparatus. The retort can be properly charged in 30 seconds, which is favourable to a high yield of gas. Though the apparatus has not been long on the market, the manufacturers have already supplied about fifty sets.

A second charging apparatus—to which the firm of Eitle has given the name "Kobold"—may be alluded to. This apparatus (constructed as shown in figs. 2 and 3) throws the coal into the retorts by mechanical means. It consists of a drum, in which are two rapidly revolving fans, which drive the coals into the retort, through a shoot which is pushed up to the mouth of the retort. The coal is carried in a uniform stream to the fans by a screw conveyor from a small coal hopper. The hopper, which can be brought to the height of the different retorts, holds exactly one retort charge, and is filled each time from a large reservoir.

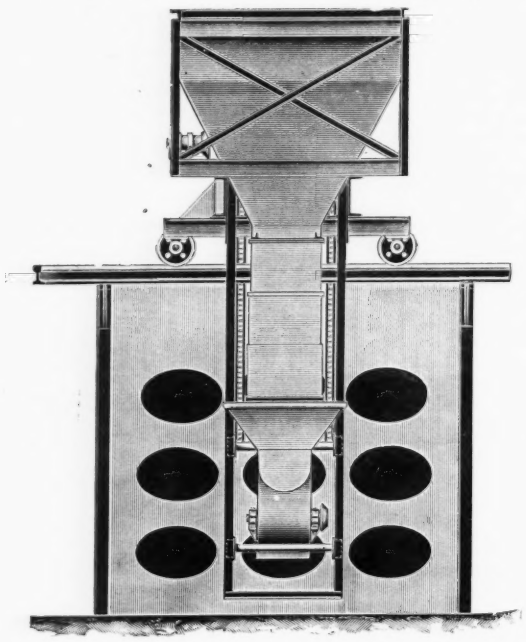


FIG. 3.—END ELEVATION OF THE "KOBOLD" RETORT-CHARGER.

The height of the layer in the retort is fixed as desired, and the filling then proceeds from the back to the front. The fans in the drum always run at the same speed; and as the retort fills, the stoker inclines the filling shoot, thereby causing a flap to fall down gradually. As the coals reach the front of the retort, they encounter increasing resistance in the shoot, and consequently the filling of the retort takes place in a regular manner. There is an appliance in the apparatus to weigh the quantity of coal for each separate charge, and a counter registers the number of charges made.

The whole apparatus, with the coal reservoir, is carried by a crane on two rails—one fixed to the front of the bench, the other to the wall of the retort-house. The installation is therefore simple, and causes no obstruction to regular working in the retort-house.

Another advantage of the apparatus is that retorts of any length, up to 6 metres (about 20 feet), can be served. Charging machines which work with a scoop, are limited to a fixed length of retort, and retorts more than 3 metres (say 10 feet) long can-out easily be dealt with. As motive power, an electro-motor is shown in the drawing, but the "Kobold" apparatus can also be driven by ropes running on any existing power-transmission shaft, or a gas-engine can be installed.

STREET LAMPS AND "CELESTRA" BURNERS.

Excellent illuminating results are obtained in a series of street lanterns fitted by the new arrangements which Messrs. Falk, Stadelmann, and Co., Limited, of Farringdon Road, E.C., are now offering to lighting authorities. The series comprises lanterns in a dozen or more styles of construction, shape, and ornamentation. They are all strongly built, and are variously fitted with opal, half opal, copper, or enamelled steel tops, and enamelled iron reflectors. One lamp, which is highly spoken of, has been expressly designed for seaside towns and other exposed positions; and in it the ordinary copper spinning and top have been substituted by a specially constructed wind and storm proof head of enamelled steel. The "Colonial" street lantern is one which has been built for shipment. It has an enamelled roof and top, and a malleable iron frame. But the great point is that every part is detachable; so that it can be readily taken apart, packed flat for transport, and fitted together again as required. All of the lamps possess an exceedingly good and serviceable appearance. The "Parade" lantern requires a little special mention, both on account of its departure from the types that have become almost standardized by long usage, and its cheapness. We illustrate the lantern, which, as seen, is attractive in form, and can claim recommendation on the ground alone that it throws no shadow. It is made with a 13-inch clear glass well; and there are only two wrought-iron stays for supporting the head, which is made of enamelled steel plate, with a specially constructed inner chimney (thoroughly wind-proof), and a cast-iron ornamental band. The top is hinged for cleaning; and the enamelled convex reflector with which it is fitted is removable. This lantern will, without doubt, render a good account of itself in use.

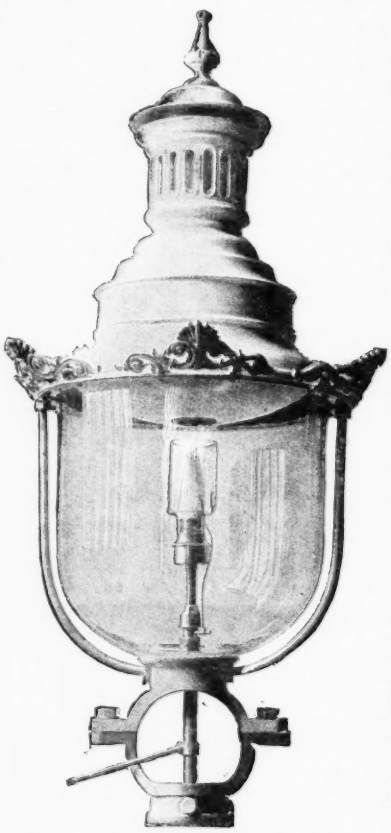


FIG. 1.—THE "PARADE" LANTERN.

Although not necessary if otherwise preferred, these lanterns are fitted—and the firm have excellent reason for preferring that they should be so—with one, two, or three "Celestra" chimneyless, incandescent gas-burners, which are among Messrs. Falk, Stadelmann, and Co.'s new specialities. These burners are made in two sizes—"C" and No. 4—with or without bye-pass and double lever and chains, and with or without an anti-vibrator. Describing the burner first. It is, as the illustration shows, much the same in outward form as other incandescent burners. The stem is a fairly long one, and it delivers into a mixing-chamber in the head of the burner of rather larger dimensions than is usual. It is in connection with the head that one of the recommendations of the burner is found. This part is purposely made heavy, so that it can be simply slid on and off and form a gas-tight junction without screwing in any way. This is convenient for cleaning purposes, as the whole of the top, including the mantle and glass, can be bodily lifted off. For positions in which the lantern is exposed to inclement weather or excessive draughts, a mantle protector is supplied, which can be readily exchanged with the portion of the burner which supports the protection glass. This mantle protector is shown fitted to the burner in fig. 2, as will be remarked by comparing it with fig. 3. The protector is only applicable to burners fitted with anti-vibrators. The anti-

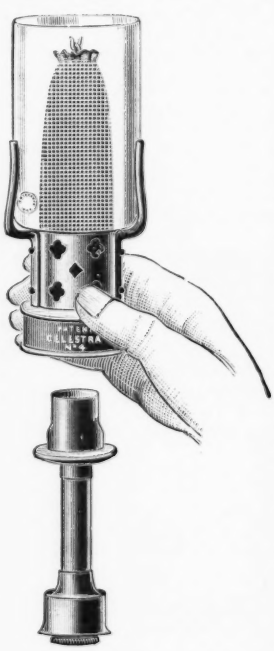


FIG. 2.

vibrator is a matter of choice with the user. It is ingeniously concealed within the top of the burner (see fig. 3), and appears to be very perfect in action. As to the consumption and lighting ability of the burner, the firm have fitted up a photometrical room at their London Offices; and readings there (to be well within the mark) accord to the "C" burner an illuminating power of 65 candles, with a consumption of $3\frac{3}{4}$ cubic feet, at 15-10ths pressure; and to size No. 4 75 candles, with a consumption of $4\frac{1}{4}$ cubic feet, also at the pressure mentioned. It is stated that the burners give the best results, so far as illuminating power is concerned, if the pressure does not exceed 15-10ths. They burn well up to 2 inches, and as low as 1 inch pressure; but whenever it exceeds the former, it is necessary to employ a governor. (The burner is also made in a form, fitted with an ornamental shield, suitable for domestic purposes.) The lamps are, if required, supplied with the firm's lever taps (illustrated in fig. 1), which work horizontally and very smoothly. This arrangement is found to save the mantles the shocks to which they are often subjected by the lamplighter in operating the ordinary form of tap.

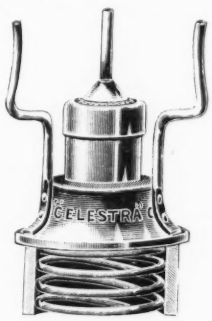


FIG. 3.

GAS-ENGINES FOR PUMPING STORM-WATER.

By the courtesy of the Main Drainage Committee of the London County Council, the members of the Works Committee of the Kensington Borough Council recently inspected the new pumping-station at Lot's Road, Chelsea, under the guidance of Mr. J. E. Worth, M.Inst.C.E., the District Engineer, who planned it and superintended its erection. It has been put up at a total cost of nearly £60,000—the principal items being £35,000 for the buildings, £10,000 for the engines, and £6000 for the pumps—to relieve the Counters Creek and low-level sewers in times of storm. The special feature of the equipment of the station for readers of the "JOURNAL" is the group of eight gas-engines, each working independently, and driving a centrifugal pump. Four are each of 210 indicated horse power, and are capable of lifting $41\frac{1}{2}$ tons (9296 gallons) of water per minute to the height of 28 feet. The remaining four, which are not quite completed, will each be of 260-horse power, and equal to raising 83 tons (18,592 gallons) of water per minute to a height of 14 ft. 6 in. The greater height to which the water has to be lifted in one case is consequent upon the different levels of the sewers.

The four main engines are started automatically; the necessary impulse being supplied by air compressors on duplicate smaller engines, which will be constantly at work, and which will also charge the centrifugal pumps by means of ejectors. One of the engines was running on the arrival of the visitors, and a second was started in their presence, with the object of showing them with what rapidity it could be put into action. The cylinders of the engines are water-cooled; a separate tank, containing 8000 gallons, being provided for each. The works are supplied with gas by a special 15-inch main, and each of the engines has a separate 500-light meter. When the whole of them are at work, it is estimated that the gas consumed will cost £5 1s. 6d. per hour—not a large sum, when it is computed that they are not expected to work for more than 100 hours per annum. Mr. Worth furnished his visitors with the following calculations he had made bearing upon the gas consumption of the engines: 18 cubic feet of gas will be consumed per horse power per hour; and 1·1 cubic feet will lift a ton of water an average height of 21 feet. When all the pumps are working, 550 cubic feet of gas will be consumed per minute, and the power generated will lift 500 tons of water.

The foregoing particulars are taken from a report presented to the Kensington Borough Council by the Works Committee at their meeting last Tuesday; and in closing it they expressed the satisfaction they had derived from the visit, and their appreciation of the excellent manner in which the station had been planned and erected.

Mr. G. T. Reid, late Gas Manager to the North British Railway Company, died at Edinburgh on the 12th inst.

Dealing, in the "Comptes Rendus," with the action of a trace of water on the decomposition of the alkaline hydrides by acetylene, M. Henri Moissan points out that dry acetylene gas only reacts with potassium hydride at a temperature of 42° C. or higher. If, however, the gas contains a trace of water, the reaction can take place at ordinary temperatures. This is attributed to the liberation of heat occurring when the reaction is started at any one point, which determines a rise of temperature to more than 42°, after which the combination becomes total.

THE ABERDEEN WATER-WORKS.

At a Scottish District Meeting of the Association of Municipal and County Engineers recently held in Aberdeen, a description of the water-works of the city was given in a paper read by Mr. J. GORDON, Assoc.M.Inst.C.E., the Assistant Burgh Surveyor.

After giving a sketch of the early sources of water, the author remarked that the quantity available having become inadequate, an Act was obtained in 1862 to introduce a gravitation supply from the Dee at Cairnton, in accordance with the plans of the late Mr. J. Simpson, M.Inst.C.E. The works were completed, and the water turned on by the late Queen Victoria, in 1866; and, with the additions and extensions carried out under the subsequent Acts of 1885 and 1893, they substantially form the present city water-works. The original water-works cost about £160,000; but up to 1902 the subsequent additional works and extension of mains increased the capital expenditure to £313,000, of which practically half has been extinguished by the operation of the sinking fund. The intake is situated at Cairnton, on the north bank of the river, about 22 miles west of the city. Between it and the intake well, a distance of 125 lineal yards, the water is conveyed in cast-iron pipes, 48 inches in diameter, laid along the bank. Within the well are situated sluices for turning off the water when discoloured, a floating gauge to indicate the quantity of water passing into the aqueduct, and screens to intercept leaves or other floating material; assistance being rendered in this operation by a floating boom and rough screen situated at the intake.

The total length of the aqueduct from the intake well to the Mannofield Reservoirs is 19 miles, and it may be divided into two sections. The first extends from the well to the settling reservoir at Invercannie—a distance of about a mile. For one-half of its length, it is constructed in rock tunnel (unlined), extending through the hill of Cairnton; while the remaining portion consists of an oval brick culvert, $4\frac{1}{2}$ feet high and $3\frac{1}{2}$ feet wide. The inclination on this section is 1 foot per mile. The second section extends from the reservoir at Invercannie to the termination of the aqueduct at the Mannofield reservoirs—a distance of 18 miles; and it has an inclination of 2 feet per mile, with the exception of a length of 2 miles at its eastern extremity, which has an inclination of $1\frac{1}{2}$ feet per mile. For the greater part of its length, this section consists of an oval culvert, built of 6-inch brickwork, 3 ft. 9 in. high and 3 ft. 2 in. wide, surrounded with clay puddle 9 inches thick carried up to a level of 3 inches below the soffit of the arch, where, however, the covering above the aqueduct is less than about 2 feet. At various points, cast-iron pipes, 40 inches in diameter, take the place of the brick culvert; and where the valleys of the Crathes Burn and the Culter Burn are crossed, the aqueduct consists of inverted syphons, each formed of one line of 40-inch cast-iron pipes. There are in all ten combined overflow and scour tanks, with the necessary culverts connecting to the nearest streams. They are arranged so that the depth of water does not exceed 3 feet; and with the water flowing at this depth, the aqueduct discharges at the rate of 8 million gallons per 24 hours—the maximum quantity the Corporation are empowered to abstract from the river. This was originally restricted to 6 million gallons per day, but subsequently increased to 8 millions by the Act of 1885.

The Invercannie reservoir, originally intended as a settling reservoir, forms the connecting link between the first and second sections of the aqueduct just described. It is circular in form, 445 feet in diameter at the top, and 392 feet at the bottom water-level; the depth of water being 14 feet, and the capacity 12 million gallons. The outlet from the reservoir consists of a standpipe 4 feet in diameter, fitted with sluice-valves at three different levels, respectively 4, 8, and 12 feet below the top water-level. The outlet-pipe is 3 feet in diameter, and discharges into a straining chamber, 19 feet long, 13 feet wide, and 22 feet deep, provided with two sets of sliding screens, each with an area of 300 square feet—one set having 20 meshes and the other 441 meshes per square inch. From the straining chamber, the water passes into a circular well 10 feet in diameter, forming the starting-point of the second section of the aqueduct; and it is delivered to the consumer without filtration—being merely passed through the screens provided at the intake, the settling reservoir, and again at the various service reservoirs.

The service reservoirs, which are situated in or near the city, are five in number, all uncovered, and the following table shows the capacity of each:—

—	—	Capacity.	Water Level above Ordnance Datum.
		Gallons.	Feet.
Low service . .	Mannofield	6,000,000	168
	,,	12,000,000	168
	Cattofield	2,500,000	155
Mid ,, . .	Slopefield	6,000,000	308
High ,, . .	Pitfodels	500,000	402

The aqueduct discharges into the reservoirs at Mannofield, which are situated close to the city boundary. The smaller reservoir, 270 feet in diameter, forms one of the original works; but the larger one, which is 370 feet in diameter, was authorized by the

Local Act of 1885, and completed in 1888. The walls are of granite masonry with a layer of clay puddle on the outside, while the bottom is formed of cement concrete laid with a fall to the scour-pipe. The depth of water is 18 feet, and both reservoirs are worked in conjunction; but the connecting and outlet pipes are so arranged that each can be used separately. Before discharging into the large reservoir, the water passes through a gauge-well, provided with a weir 10 feet in length; and there are two screening chambers—one constructed between the reservoirs, and the other at the outlet of the smaller one. Situated above the former chamber is an automatic clockwork apparatus recording the varying depth of water; and on the main outlet-pipe, which is 36 inches in diameter, is placed a disc meter on the Deacon principle, giving a continuous record of the discharge. The cost of the larger reservoir was £16,100, while the land cost an additional sum of £6600, and includes a large area for further extensions of the reservoir works. The area supplied from the low-service reservoirs embraces parts of the city below the level of 125 feet above Ordnance datum, and practically six-sevenths of the quantity consumed is drawn from these reservoirs.

The Cattofield reservoir is situated in the north part of the city, in proximity to the district which its supplies. It is rectangular in form, 263 feet long and 128 feet wide, and the depth of water is 12 feet. It is constructed of cement concrete throughout, and the walls are an average thickness of 3½ feet. A screening chamber is provided, into which a short length of 21-inch outlet-pipe discharges; and immediately adjoining it is situated the meter and valve house, through which the discharge mains pass. These are three in number, each 12 inches in diameter, and furnished with valves, disc meters, and hatch-boxes for the insertion of the pipe-cleaning apparatus. Land is provided for a second reservoir, and the north wall of the existing reservoir will eventually form the division wall. The cost of the works in connection with this reservoir was £6460.

The Slopefield reservoir is situated about a mile west of the city boundary, and provides the necessary storage for the mid-service supply, which is pumped from the aqueduct by the steam pumping-engines at Cults. It supplies the part of the city area formed by a zone extending between the levels of 125 and 250 feet above Ordnance datum; but some lower districts of the city are also provided with mains supplied from this reservoir, and used for fire-extinguishing purposes. It is 270 feet in diameter, built of granite, and provided with a cement concrete bottom; the mode of construction being similar to that of the larger reservoir at Mannofield. The inlet and outlet pipes are 20 inches in diameter, and a gauge-well is provided at the inlet, as also a disc meter on the outlet-pipe; and a bye-pass main provides for the supply being maintained direct from the pumping main when the reservoir is emptied for repair. The straining-well is 20 feet square and 22 feet deep, furnished with two sets of screens—one with a large and the other with a small mesh. An electric recording apparatus automatically registers at the pumping-station the depth of water in the reservoir. This work was completed in 1888, at a cost of £8840. The land cost £2850 additional, and includes an area sufficient for a duplicate reservoir.

The high-service reservoir at Pitfodels is circular in plan, 80 feet in diameter, with a depth of water of 14 feet. It furnishes the supply to the built-on portion of the city area situated above the level of 250 feet above Ordnance datum; but up to the year 1888, the present mid-service area was also supplied from it. The supply is pumped from the aqueduct by means of the hydraulic-engines situated at the lower pumping-station at Cults. The inlet and outlet pipes are 10 inches in diameter; the latter being fitted with a meter. A bye-pass pipe is provided, as well as an electric water-level recording apparatus communicating with the pumping-station.

As already indicated, there are two pumping-stations situated at Cults, about two miles west of the city boundary, viz.—(1) a steam pumping-station, close to the aqueduct at Den of Cults, furnishing the supply to the mid-service reservoir at Slopefield; and (2) a hydraulic pumping-station at St. Devenick's Bridge, furnishing the supply to the high-service reservoir at Pitfodels. The buildings at the former station consist of an engine-house, 57 feet by 35 feet, and a boiler-house, 54 feet by 30 feet, provided with a chimney 100 feet in height, and the necessary accommodation for the storage of coals. The boilers are two in number, of the Lancashire type, each 6½ feet in diameter and 26 feet in length; the flues being 36 inches in diameter, and provided with six Galloway tubes in each. The steam pressure is 80 lbs. per square inch, and the feed-water is raised to a temperature of 200° Fahr., by being passed through a set of Green's economizers consisting of 64 tubes.

The two pumping-engines are both compound, and fitted with surface condensers; No. 1 engine being capable of developing 80-horse power, and No. 2 engine 100-horse power. Engine No. 1 is of the tandem type; the steam and pumping pistons being directly coupled. The diameter of the high-pressure cyclinder is 16 inches; of the low-pressure cylinder, 30 inches; and of the pump (double-acting), 18 inches—the stroke being 32 inches. Working at the normal speed of 22 strokes per minute, the pump delivers 76,000 gallons of water per hour against a head of 140 feet. Engine No. 2 has a high-pressure cylinder 18 inches diameter, a low-pressure cylinder 30 inches diameter, a stroke of 33 inches, and makes 52 strokes per minute. The pumps, however, make only 13 strokes per minute; the reduction in the rate being effected by geared pinions fitted with helical teeth. The pumps are double acting, two in number, each 18 inches diameter. Working at the normal rate, they deliver 99,000 gallons per hour against a head of 140 feet.

The suction-well is 6 feet long and 4 feet wide, situated at the north end of the engine-house, and is connected with the aqueduct by a short length of 2-feet pipe. The rising main is 20 inches diameter and 1500 lineal yards long, provided with sluice-valves at the connection to each pump, two air-vessels, and the usual reflux valve, which is fixed on the main immediately outside the building. The total cost of the station—including land, buildings and machinery—was £8100.

The hydraulic pumping-station consists of a building 32 feet by 29 feet, containing a duplicate set of hydraulic engines and pumps. The water actuating the engines flows by gravitation from the aqueduct, which is 139 feet above the station; the connection between them consisting of 550 lineal yards of cast-iron pipes, partly 18 inches and partly 15 inches in diameter. The diameter of the power cylinder of each engine is 25 inches, and that of the single-acting pump placed in tandem therewith 18 inches; the length of the stroke being 36 inches. The two air-vessels are of cast iron, cylindrical in form, and 10 feet long by 3 feet in diameter; one being fitted on the supply, and the other on the delivery main. The capacity of each pump, working at the normal rate of seven strokes per minute, is 12,000 gallons per hour. The rising main is a 10-inch, 2030 lineal yards in length; and the head on the pumps is 375 feet.

The average amount of water supplied per day from the service reservoirs during the year 1902 was as follows:—

	Gallons.
From the low-service reservoir	5,944,970
,, mid ,, ,, ...	871,517
,, high ,, ,, ...	25,186
Total	6,841,673

The population supplied was 156,000; and the average quantity consumed per head was thus 44 gallons, of which 9 gallons represented the proportion used for trade purposes. The assessment charge on owners is 1½d. per pound and on occupiers 7d. per pound of rental; while water for trade purposes is supplied according to a table of charges, or by meter, the latter rates varying from 7d. to 2d. per 1000 gallons, depending on the quantity consumed. The length of the distributing mains is 126 miles, and the trade meters number 740.

Since the opening of the present water-works 37 years ago, the city boundary has been extended on three occasions; and within recent years there has been a further rapid increase in the population. The consequent steady increase in the total daily consumption makes it apparent that the time is rapidly approaching when the quantity of water required daily for the supply of the city will exceed that which the Corporation are entitled to abstract from the river at the present intake, and which can be conveyed to the city by the existing aqueduct. In view of this, the City Council have given a considerable amount of attention to the question of a new or increased supply; and some time ago they requested Mr. Charles Hawksley to make the necessary investigations and submit a report on the matter. This he did; and the Council are at present giving to the question the careful consideration which the importance of the subject demands.

A Further Warning.—In the "JOURNAL" for June 9 (p. 667), we mentioned the fact that a man signing himself "Thos. Clarkson, B.Sc.Lond., Wh.Sc.," had been applying for assistance from engineers in various parts of the country, stating that he was a Civil and Gas-Works Engineer and an Assoc.M.Inst.C.E., who had been for upwards of two years without an engagement, through ophthalmia. Inquiries showed that the man was not what he represented himself to be; and it therefore became our duty to warn readers to this effect. The publicity given to the matter on that occasion has not, however, put an end to his begging campaign; for he was last week down in Surrey, where he applied for help by letter addressed to a Gas-Works Manager in very much the same terms as before. This further warning should leave Engineers who may in future be approached by this man in no doubt whatever as to the way in which his appeals should be treated.

Apparatus for Analyzing Gas.—A compact apparatus for gas volumetric analysis, of the usual type, in which the gas is moved backwards and forwards through the absorbing vessel by means of a cylinder and piston, is described in the specification of a French patent, taken out by Madame Bolikowska, and abstracted in the "Journal of the Society of Chemical Industry." The cylinder is disposed vertically, and its piston is pressed downwards by the action of a spring coiled round the rod. The upper part of the rod is screwed, and passes through the cover of the pump, which serves as a nut. Above the cover, and attached to the rod, is a disc divided radially into 100 equal parts, against which disc is a fixed pointer. If the measuring vessel of the apparatus is filled (at atmospheric pressure) in such a way that the pointer indicates 100, after the gas has been pumped into and back out of the absorption-tube till, at atmospheric pressure, the vessel is once again full, the pointer shows a smaller number on the disc—the loss being the proportion in the gas of the constituent which has been removed.

REGISTER OF PATENTS.

Gas-Engines.—Edwards, E., of Chiswick, W. No. 20,760; Sept. 23, 1902.

This invention relates more especially to motive-power engines of the kind referred to in patent No. 19,564 of 1901, where was described an engine consisting of two cylinders, having working in them pistons connected by rods to two cranks set at an angle to each other upon a driving-shaft revolving in bearings. Inlet and outlet valves were provided, so that (when the shaft revolves) a combustible mixture is drawn into one cylinder by the down-stroke of the piston in it, which on its up-stroke compresses the mixture, and when near the end of its stroke delivers it, through passages in the pistons and between the cylinders, into the upper part of the other cylinder, the piston in which moves in advance of the first-mentioned piston, and is at the top of its stroke when the first or compressing piston is some distance from the upper end of its stroke. The compressed combustible mixture is transferred to the upper part of the second or operating cylinder, and is ignited when the first piston has reached the top of its stroke and the second or operating piston has moved down for some distance.

The present proposal is to omit the passage between the two cylinders, and the passages through the pistons, and make the crank-shaft revolve in the opposite direction, so that the piston in the first or compressing cylinder is considerably in advance of the one in the second or operating cylinder as the shaft revolves; and also to provide a passage between the upper ends of the two cylinders (preferably in the covers of the latter) containing a valve opening from the first to the second cylinder, and kept closed if necessary by a light spring.

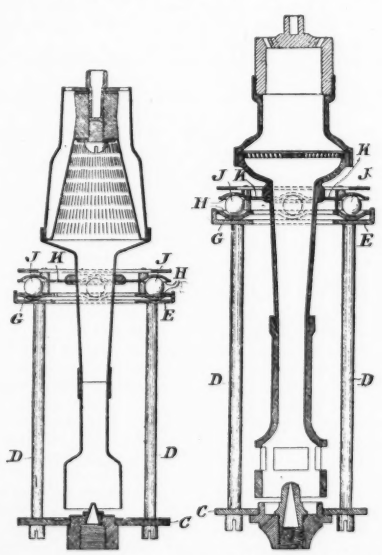
Toughening Compound for Incandescent Gas-Mantles.—Hirsch, J., of Berlin. No. 23,986; Nov. 3, 1902.

This invention comprises the finishing of incandescent gas-mantles by stiffening or toughening them by means of a new compound, in place of the usual varnish consisting of collodion formed of a solution of nitro-cellulose in sulphuric ether with the addition of secondary ingredients, such as camphor and castor oil. The proposed substitute (while equally efficient for the purpose) is said to be "devoid of the highly inflammable and dangerous qualities of the nitro-cellulose compound," and "exempt from the hygienically injurious effects incidental to its employment."

The patentee forms a compound having as its basis a solution of an acetylated preparation of cellulose or hydro-cellulose or derivatives thereof, with or without the addition of suitable secondary ingredients (such as, for instance, resins and oily substances), and pure cellulose or derivatives thereof—such as oxy-cellulose, hydro-cellulose, or other cellulose preparations. As an example of the preparation of the improved compound, 10 parts of an 11 per cent. acetylated cellulose would be dissolved in 100 parts of dilute alcohol or methylated spirit, to which are added one part of resin (for instance, colophonium), and about one-half part of an oily substance (for instance, glycerine), and one part of pure cellulose or of a cellulose derivative (for instance, amyloid). The skeleton mantle is dipped in the solution as often as may be necessary to deposit a coating of sufficient thickness on the mantle, which is then dried.

Anti-Vibration Devices for Incandescent Gas-Burners.—Carpenter, C. C., of Old Kent Road. No. 15,303; July 10, 1903.

This is an improvement on patent No. 13,545 of 1900—to counteract the vibration and shocks in incandescent mantles and burners by mounting the part of the burner which carries the mantle on balls, working in cup-shaped recesses, so that a certain amount of lateral motion may be given to the part. The earlier invention does not lend itself very favourably for use with elongated burners; and the object of the present invention is to apply the 1900 invention to burners having a long stem, or where the centre of gravity of the burner is very high.

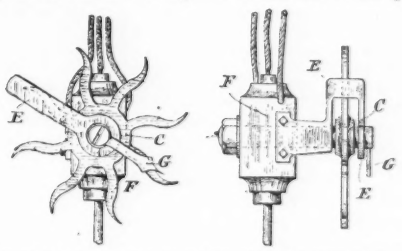


Two well-known types of burner are shown with the anti-vibration device applied.

Attached to the nozzle of the burner is a disc C, having columns D, which support an annular trough E, in which is mounted a piece G having smooth cup-bearings H, in which balls J work. Secured to the burner is another ring K, also provided with smooth cup-shaped recesses H, which form a bearing surface and rest on the balls J, so that the whole of the burner is perfectly free to move in a lateral direction, but in such a manner that it will always return to its normal position.

Multiple-Way Gas-Cocks.—Bray, J. W., of Leeds. No. 16,719; July 30, 1903.

In carrying out this invention, the plug cock (of the ordinary description) has any suitable number of ports. In the case where there are two burners and a bye-pass, it might be desirable to have four ports. Attached to the spindle of the cock is what might be termed a star-shaped wheel C, whereon (for the case mentioned above) are eight arms. Engaging loosely with the spindle is one end of a U-shaped lever or stop E, through which the arms can pass. The other end of the stop is firmly attached to the gas-valve or the like F, thus preventing any movement of the stop. Attached also to the spindle is an



indicator G, which is always in a line with the stop when the supply of gas is turned off. One of the arms is always inside the stop.

In order to turn on the supply to the bye-pass, the first arm is pushed up as far as the stop E, and the gas then flows through the bye-pass, and also through the cock to the two burners. Where there is an ignition-jet attached to the bye-pass, this will then be lighted, and will in turn ignite the gas passing through the two burners; on pushing up the next arm to the stop, the supply through the bye-pass is cut off; on pushing up another arm, the supply to one burner is cut off; and on pushing up the fourth arm, the whole supply is cut off.

APPLICATIONS FOR LETTERS PATENT.

20,265.—Dunlop, J., "Gas-producing plant." Sept. 21.
20,330.—Pooley, H., and Poulson, A., "Enrichment of gas." Sept. 22.
20,364.—Moeller, J., "Incandescent lighting for street lanterns and other lamps." Sept. 22.
20,365.—Moeller, J., "Atmospheric gas-burners." Sept. 22.
20,387.—Reichenbach, F., "Cooling devices for gas-engines." Sept. 22.
20,453.—Gesellschaft für hängendes Gasglühlicht m. b. H., "Downwardly burning incandescent gas-lamp." Sept. 23.
20,481.—Zechnall, L., "Incandescent gas-burners." Sept. 23.
20,483.—Williams, E. D., "Shade-holder for gas-brackets." Sept. 23.
20,505.—Alexander, C. J., "Chimneys of glass and other material." Sept. 24.
20,556.—Lake, H. H., "Increasing the intensity of incandescent light." A communication from Gesellschaft für Flüssige Gase Raoul Pictet and Co. Sept. 24.
20,570.—South, J., "Manufacture of combustible gas." Sept. 24.
20,574.—Wilson, J., "Gas-producing furnaces." Sept. 24.
20,588.—Simmonds, H., "Drawing coke from gas-retorts." Sept. 25.
20,618.—Scott-Snell, E., "Automatically extinguishing gas at predetermined times." Sept. 25.
20,624.—Mason, J. F., "Incandescent gas-burners." Sept. 25.
20,677.—Holmes, E. D., "Extracting tar from illuminating gas." Sept. 25.
20,678.—Cerasoli, A., "Gas-producers." Sept. 25.
20,718.—Royston, E. R., "Regulating the pressure of gas in holders." Sept. 26.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Cement Manufacturers and the Coke Trade.

Sir,—Will you permit me to point out, by way of supplement to your correction of the Rochester electioneering fable, what is apparent from the blue-book from which you quote—that cement does not figure at all among our exports to Germany? Why? We are told day after day that our export trade is being ruined by iniquitous foreign imposts. Yet here is a market close at hand (of great extent and hitherto free), in which our cement makers do not sell a ton, except what may dribble through from a neighbouring State. Surely this is a case for further inquiry. What are the relative prices of German and English cement, and to what extent and to what countries is the former exported?

The United States tarift, as published by the Board of Trade, gives the duty levied on cement in that country, not as "about 73 per cent. on the value," as you have assumed, but 4½d. or 4d. per cwt., in barrels, &c., or in bulk respectively. This is for portland, roman, and other hydraulic cements; other cement being charged 20 per cent. *ad valorem*. Whether these rates are prohibitive or not, it was certainly to be expected that—tariff or no tariff—the United States would in

course of time manufacture cement for itself, having regard to its almost boundless natural resources. To send cement there seems almost like carrying coal to Newcastle. The wonder is, not at the smallness of our present exports, but at their comparatively large extent only a few years ago. Here again, it might be useful to know what, if any, changes have been made in the tariff during the last twelve years.

You draw attention to the loss of our cement trade with France and Russia—both of them Protectionist countries. There is, however, another case of shrinkage which equally calls for notice. Twelve years ago our cement trade with Holland was worth as much as that with France and Russia put together; to-day it is only about one-sixth of its former amount—having fallen from £30,210 to £5000. Yet Holland is not Protectionist as regards cement, which is admitted duty free. Belgium and Denmark are also free countries as regards cement; but they might be ultra-Protectionist for all the trade we do with them in that article. Here, then, are four countries—Germany, Denmark, Holland, and Belgium—forming one huge free market, in which our trade in cement is practically *nil*. Where, in such a case, is the conspiracy against our industries of which so much political capital is now being made? If our cement makers can do no trade at all when there are no tariffs to obstruct them, what do they stand to gain from a flourish of the "big revolver?" Or do they not know that "retaliation" spells "protection," and see in it the prospect of a duty upon cement imported into this country? That reward may be theirs, if individual and private interests are suffered to prevail.

15, *Victoria Street, S.W., Oct.* 3, 1903. CHAS. HUNT.

[Doubtless the cement manufacturers have their own views of the points raised by Mr. Hunt; but we cannot go further into this matter. Our only reason for touching the case of cement at all was because of its close relation to the gas-coke trade, just as the common practice of "dumping" the surplus coke of large gas-works appeared to throw some light upon certain questions now before the public. The pounds, shillings, and pence of the gas industry are our concern, not politics; and if we have borrowed a few statements from public sources which appear to be of a partial character, it has not been with the slightest intention to import politics (as such) into the "JOURNAL."—ED. J.G.L.]

Gas Companies and the Fiscal Question.

SIR,—At the recent meeting of the Exmouth Gas Company, Mr. H. A. Willey stated [see last week's issue] that the cotton mills in Lancashire were working three-quarter time; and he uses this as an argument in favour of a change in our fiscal policy. I am sure he could not have chosen a more unfortunate argument. The cotton manufacturing industry of every country is equally affected, and that not by any fiscal policy, but simply through the "cornering" of the raw material by speculators not otherwise interested in the industry. The operative is in dire distress; a tax on his food would mean starvation. Gas companies will have to look in other directions for improvements in their business than those to which Mr. Willey would pilot them.

Manchester, Oct. 1, 1903. THOS. MARSH.

Output of a Gas-Works having 10-Inch Connections.

SIR,—Can any of your readers inform me the largest quantity of gas that can be made in a works with 10 inch connections throughout? O'Connor's "Pocket Book" says 20 millions; but there must be many works making 50 to 60 millions with this sized connections.

Perhaps a reader can also give a reliable rule for determining the extent to which a plant with good retort power could work up under the above conditions.

Oct. 3, 1903. MANAGER.

Forfar Corporation Gas Undertaking.

SIR,—I very much regret the mistake in the "JOURNAL" of Sept. 22. The report you printed as an estimate for the coming year was not an estimate but the result of the past year's working. It looks rather stupid for a Manager to make out an estimate and show a surplus of £640, instead of reducing the gas still further than we have done. Would you therefore please correct this error.

Gas Office, Forfar, Oct. 3, 1903. JAMES BAXTER.

Dublin Streets in Darkness.—The following is from the "Irish Daily Independent and Nation" for the 29th ult.: "In face of the undesirable state of things which prevailed in several portions of the city on Saturday night last, in consequence of a temporary suspension in the electric light supply, it is to be feared that the ratepayers will be awakened to the fact, when it is too late to apply a wholesome remedy, that they have been led by the City Fathers into a transaction somewhat like 'buying a pig in a poke.' After the excessive expenditure which has been incurred in connection with the introduction of the new electric lighting scheme, the occurrences of Saturday night do not promise a satisfactory working of the system which has entailed a financial burden on the ratepayers out of all proportion to the benefits to be derived. In Dame Street, at a time when the traffic in that thoroughfare was at its greatest, and business people were actively engaged attending to their customers, the electric supply completely failed, and for fully half-an-hour business, so far as the establishments using the current provided by the Corporation were concerned, was altogether at a standstill. In the street, the arc lamps were also extinguished; and, as a result, both pedestrian and vehicular traffic was rendered almost impossible. The exact cause of the breakdown has not as yet been explained; but, whatever its cause, it does not by any means afford a reassuring augury for the successful working of the new electric system, of which those responsible for it have indulged in optimism to a degree which circumstances have shown is altogether unwarranted."

MISCELLANEOUS NEWS.

BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held last Wednesday, at the London offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. H. B. Chamberlain) read the notice convening the meeting, and also the report of the Directors for the six months ending June 30, together with the accounts of the Norwich station, as required by the Company's Act. The report was as follows:—

The available profit is £25,277, after deducting the following sums, and adding £427 from the Trowbridge reserve fund, the parliamentary interest at that station not having been realized by that amount. The deductions (omitting shillings and pence) are as follows: Income-tax, £1244; Hull debenture interest, £2128; Norwich debenture interest, £898; Potteries debenture interest, £378; Trowbridge debenture interest, £165; interest on debenture stock, £1135—total, £5949.

HULL—The gas-rental at this station shows an increase of £3227, as compared with that of the corresponding period of 1902; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke shows a decrease of £260; tar and tar distilling, an increase of £1223; ammoniacal liquor and sulphate, an increase of £884. Coals have cost 12s. 11d. per ton, as against 15s. 3d. Coke has realized 11s. 4d. per ton, as against 13s. 4d. The gas sent out was 551,317,000 cubic feet, against 526,225,000 cubic feet—an increase of 25,092,000 cubic feet, equal to 4·76 per cent. Of this quantity, 48,838,000 cubic feet was supplied in bulk to the Corporation for the supply of the Old Town. The profit realized is £5401 in excess of the parliamentary interest. This sum has been invested in Consols, making the reserve fund £23,566.

NORWICH—The gas-rental at this station shows an increase of £1883, as compared with that of the corresponding period of 1902; the price of gas having been reduced from 3s. 6d. to 3s. 3d. per 1000 cubic feet from the 1st of April, 1902. Coke shows an increase of £142; and tar and ammoniacal liquor, a decrease of £122. Coals have cost 16s. 9d. per ton, against 17s. 11d. Coke has realized 9s. 2d. per chaldron, against 9s. 7d. The gas sent out was 221,647,000 cubic feet, as against 198,264,000 cubic feet—an increase of 23,383,000 cubic feet, equal to 11·79 per cent. The profit realized is £1847 less than the parliamentary allowance.

POTTERIES—The gas-rental at this station shows a decrease of £235, as compared with that of the corresponding period of 1902, the price of gas having been reduced from 2s. 8d. to 2s. 6d. per 1000 cubic feet from the 1st of April, 1903, and 3d. per 1000 cubic feet on gas used for gas-engines from the 1st of January, 1903. Coke shows an increase of £33; and tar and ammoniacal liquor and sulphate, of £342. Coals have cost 12s. 2d., against 13s. 4d. per ton. Coke has realized 6s. 2d., against 6s. 9d. per ton. The gas sent out was 187,166,000 cubic feet, against 183,704,000 cubic feet—an increase of 3,462,000 cubic feet, equal to 1·88 per cent. The profit realized is £2306 in excess of the parliamentary interest. This sum has been invested in Consols, making the reserve fund £22,373.

TROWBRIDGE—The gas-rental shows an increase of £236 over the corresponding period of 1902, the price of gas having been the same—viz., 3s. 4d. per 1000 cubic feet, with discounts. Residual products show an increase of £160. Coals have cost 15s. 8d., against 16s. 11d. per ton. Coke has realized 11s. 3d., against 10s. 7d. per ton. The gas sent out was 29,956,500 cubic feet, as against 28,793,500 cubic feet—an increase of 1,163,000 cubic feet, equal to 4·04 per cent. The profit realized is £427 less than the parliamentary interest. This sum has been taken from the reserve fund, leaving a balance of £477.

HOLYWELL—The gas-rental shows a slight increase. The residual products have realized a little more. The profit is £340.

The available profit, added to the previous balance of profit and loss, amounts to £57,725. From this sum, the Directors recommend a dividend at the rate of 10 per cent. per annum, clear of income-tax. This will amount to £23,000, and leave a balance of £34,725.

The Directors who go out of office are Colonel Josiah Wilkinson, and Major-General William T. Corrie; the Auditors are Mr. Edward Yardley and Mr. E. Knowles Corrie; and they respectively offer themselves for re-election.

The CHAIRMAN said it was with a sense of considerable gratification that he rose to make a few remarks with regard to the proceedings of the half year; and he was sure it would be satisfactory to the shareholders present, as well as to those who were absent, and who would receive an account of his speech, to be told a few of the details respecting the profits at the stations. Comparing the half year with that ending June 30, 1902, at Hull the profits were £21,181, as against £12,933; at Norwich, they were £7157, as compared with £6588; at the Potteries, they were £8338, as against £5691; and at Trowbridge, they were £1231, as compared with £718. These were the principal stations at which the Company's business was transacted; and he was sure the shareholders would agree with him that the figures showed a very satisfactory state of affairs. Of course, they would understand that the whole of this profit did not go into the pockets of the shareholders, because they had at Hull and at the Potteries considerably exceeded the rate of interest they were allowed to charge by their Acts. Therefore, the balance was transferred to the reserve funds, which, in the case of Hull during the past few half years, had been considerably depleted. It might be of interest to the shareholders if he gave some facts with regard to the reserve. Before the great rise in the price of coal, the Hull reserve stood at £39,333; and, as he had often explained, the Directors thought it wise to take away from the reserve fund in lieu of raising the price of gas considerably to their consumers. He had also in his speeches at various times referred to the fact that the Directors had every reasonable anticipation that, in course of time, they would be earning the full interest, and be able to replace to the reserve fund some of the money that had been taken from it. His prognostication had come true, because, in this half year, they had been able to add (as the Secretary had informed the shareholders in reading the report) £5401 to the reserve fund, bringing it up to £23,566; and the Board hoped that, in future half years, they would be in a similar position to that in which they were at present, and be able to increase the fund until it reached the amount at which it stood in 1900. With regard to the general business of the Company at the different stations, there had been a satisfactory increase. At Hull, though the business of the town had not been in a good condition, the increase was 4¾ per cent.; and it was satisfactory

to know that the increase was wholly in their own district. The shareholders knew the Company were under contract to supply gas in bulk to the Corporation, for the Old Town, at a low and fixed price. But this supply had fallen short, compared with the corresponding half of last year, by about 500,000 cubic feet; so that the whole of the increase was, as he had said, in their own area, which was still extending, and he saw no reason why a fair and moderate amount of increase should not be continued in future half years. Concerning the works, they had had nothing in the way of capital to expend at Hull during the half year. Everything was in the most satisfactory state; and they looked forward to being able to supply their consumers during the winter with perfect regularity. With regard to Norwich, it would be remembered that, when he last addressed the shareholders, they had a Bill in progress in Parliament to give the Company fresh powers at that station. As he then explained, a conference had been held between some of the Directors and the authorities of Norwich, through which all opposition in Parliament was avoided; and he was glad to say they encountered no further opposition. The Bill had now become law; and they were proceeding with the work, which was absolutely necessary, of remodelling the Norwich plant. The alterations and extensions were proceeding very favourably. Mr. Corbet Woodall only visited the station the previous week; and the Board had just had before them a satisfactory report from him as to the progress of the work. New retort-benches had been built, and were partly in action; and they hoped that, in a short time, a further portion of the settings would be put to work. Therefore, although other parts of the works were rather behindhand, the Directors had no fear as to the winter's work being met in a very satisfactory manner. The increase in the sales of gas, of which he spoke last half year as having been abnormal, had also in the past half year been abnormal. In fact, the results of the working showed that the increase had been no less than $11\frac{3}{4}$ per cent., which, of course, was very large for an old-fashioned city like Norwich. There was another matter he should like to mention to the shareholders with regard to Norwich. Some years ago, the Board had an opportunity of buying a very suitable site for offices, in a very prominent situation in the city, facing on to the Market Place. They took credit to themselves for having been benefactors to Norwich, inasmuch as, by purchasing the site and building, they abolished a public-house. They bought the property exceedingly cheap; and up to now it had answered the requirements of the Company very well. But with their increasing business, they found they were now being crowded up, and so it was necessary they should add to their accommodation. It happened that adjoining their existing offices there stood another public-house of rather a lower kind than the one originally purchased; and, after a certain amount of negotiation, they were able to buy this up too, at what, he thought, was a most reasonable price. The Directors had concluded the purchase; and shortly they would be extending the offices. Then, he was perfectly certain, anybody who visited Norwich, and looked at the site would be assured the Company had the finest possible site for showrooms and offices in the city. This property, he might add, was freehold. As to the Potteries, it would be remembered that, on the last occasion, he gave some particulars of the new works which they had in course of erection at that station. He also then said he hoped the retort-house would be so far completed that they would be able to use it during the coming winter. Unfortunately, the weather, as they all knew, had been so extraordinarily bad as to retard the building operations to such an extent (of course, this was through no fault of the contractors) that the Company would not benefit from them, in the way the Board had hoped to, this winter. The building, however, was going on satisfactorily now, though perhaps they would not make use of it until next year. The Board had made a reduction in the price of gas at the Potteries by 2d. for lighting (making it 2s. 6d.), and by 3d. for industrial purposes. He thought that in places like the Potteries—in all industrial centres of the kind—it behoved gas companies to look very carefully into the price of gas for manufacturing use. He wished all gas companies in London and other places could be induced to follow the example of those companies who had a separate price for industrial gas. He might say that the railway siding which was putting their Potteries works in connection with the North Staffordshire line was now nearly completed, and would certainly be finished in time for the working operations. At Trowbridge (where, it would be observed, they had been obliged to draw a small amount from the reserve fund to make up the dividend), they had given a reduction in price, from July 1, of 2d. per 1000 cubic feet; and so they were now supplying gas there at the same price as before the rise in the cost of coal. As to the small amount taken from the reserve fund, he wished to say that he did not think it would occur again, because it was somewhat of a kind of adjustment of accounts, inasmuch as the alterations which they entered into at Trowbridge two or three half years ago necessitated their spreading the expense over several half years, because one half year could not bear the total expense. Therefore this sum would now be extinguished, and the whole of the profits would hereafter be available for the station. There was only one other matter he wished to mention in connection with the accounts. The shareholders would have noticed that they had, as in the previous half year, written off £1000 as depreciation from the Yarmouth tar-works. This the Directors would continue until they considered the Yarmouth works were written down to their proper value. In formally moving the adoption of the report and accounts, he could congratulate the shareholders on what he regarded as a very satisfactory and successful half year for the Company.

Mr. FREDERICK WILKIN seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. CORBET WOODALL, a dividend at the rate of 20s. per share, clear of income-tax, was declared.

Moved by the CHAIRMAN, and seconded by Major-General W. T. CORRIE, Colonel Josiah Wilkinson was returned to his seat at the Board, as was also Major-General Corrie, on the motion of the CHAIRMAN, seconded by Mr. R. S. GARDINER.

The Auditors (Messrs. Edward Yardley and E. Knowles Corrie) having been re-appointed,

A hearty vote of thanks was passed to the Chairman and Directors, on the proposition of Mr. BURNEY, seconded by Mr. LEONARD WILKINSON.

The CHAIRMAN, having responded, moved a similar vote to the Secretary, the Engineers, and their staffs at the various stations for their able work. He added that, particularly on this occasion, would he mention the admirable work which had been done, under somewhat disadvantageous circumstances, by Mr. Glover, their Engineer at Norwich. It was a very awkward thing, in a city of some 100,000 inhabitants, to be suddenly called upon to remodel a very old works in a satisfactory manner, and at the same time to carry on the business of so large a place, and give a proper supply of gas. Mr. Glover had done his work admirably; and he (the Chairman) was certain he would carry it to a satisfactory conclusion. He and all the officers deserved the thanks of the shareholders for their efforts on behalf of the Company.

Mr. CORBET WOODALL said he was glad to have this opportunity of seconding the motion, and to endorse most fully all the Chairman had said with regard to Mr. Glover's work. Both at the Potteries and at Norwich, the work in the hands of the Engineers was of an important and trying character. He was quite sure that all the officers and their staffs were fully and most zealously devoted to the interests of the Company.

The motion was unanimously agreed to.

A brief acknowledgment by the SECRETARY ended the proceedings.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices last Wednesday—Mr. CHARLES LAWLER, J.P., in the chair.

The SECRETARY and MANAGER (Mr. F. T. Cotton) having read the advertisement convening the meeting, the report and accounts for the six months ending the 30th of June, noticed in the "JOURNAL" last week, were presented.

The CHAIRMAN, in moving the adoption of the report and accounts, said it would be seen from the latter that the Company had sold in the period covered by them 691,318,000 cubic feet of gas, compared with 664,216,000 cubic feet for the corresponding six months of 1902; being a rise of 27,102,000 cubic feet. Though there had been this increase in the quantity sold, they had received £2165 11s. 11d. less for their gas. This had been caused by the reduction of 3d. per 1000 cubic feet which took place at the end of the last December quarter, amounting to £18,000 per annum. Notwithstanding this large concession, a further reduction to the extent of 2d. would take place from the coming December quarter. This would amount to £12,000 per annum; making together £30,000 per annum, which would go to the benefit of the consumer. For coke there had been received £16,321—an advance of £1321 4s. There was a decrease of £210 18s. 7d. in the return for breeze; but there was an increase of £778 17s. for sulphate of ammonia—showing that the farmers were preferring this material to the other kinds of manure. They had realized £4172 for tar, which was an increase of £1644 9s. on the corresponding period of 1902. The decrease in the gas-rental was, as he had said, £2165 11s. 11d.; the increase in the amount received for residuals was £2533. The extra number of slot meters for the half year was 1494; and the number now in use was 15,094. The additional cookers for the half year were 723; the number in use being 14,292. He mentioned at the last half-yearly meeting that the Board had completed arrangements for taking in charge and keeping in order the incandescent burners of the consumers free of cost, and also for supplying new mantles or any material when necessary, charging cost price for whatever was used. A very large number of consumers, employing 30,000 burners, including many of the principal buildings and churches, had availed themselves of the Company's offer, and had expressed themselves as well pleased with the result.

Mr. MAURICE BROOKS seconded the motion; and it was carried unanimously.

Dividends at the rates of $10\frac{1}{2}$ and $7\frac{1}{2}$ per cent. per annum on the old and new shares respectively were then declared; and the proceedings closed with votes of thanks to the Chairman, Directors, and officers of the Company.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly General Assembly of Proprietors of this Company was held at the Offices, St. Helen's Place, Bishopsgate Street, last Thursday—Colonel A. R. M. LOCKWOOD, M.P., in the chair.

The SECRETARY (Mr. I. A. Crookenden) having read the notice calling the meeting,

The CHAIRMAN said it would perhaps not be advisable, at the present juncture, to go into the details of the accounts; but the Directors would be very glad to give the proprietors any information on any point at the offices. As they would quite understand, the Company were entering on a very serious question as regarded their property; and while the Directors were not the least afraid of anything, he thought it would be better if the meeting did not go into any detailed discussion on the accounts. With their permission, he desired, on behalf of the whole Board and the staff, to express their deep regret at the decease of their old friend Dr. Smiles, who joined the Board 22 years ago. He took the deepest interest in the affairs of the Company, rarely missed a meeting, and was esteemed and appreciated by the staff as well as by the Directors. The accounts had been duly audited by the Government Auditor and by the Company's Auditors, and the statement was very full. He might say at once that the increase in the revenue account—£5402—was rather disappointing to the Board; but, as he had often before reminded the proprietors, the result of the whole year should be considered in estimating the Company's progress, inasmuch as the second half—that ending on Dec. 25—always showed a larger increase than the first. The road-watering, for instance, was a "season's" charge, and did not come into the Midsummer period at all; and it also happened

—he could hardly particularize the causes—that other meter services were greater in the second than in the first half of the year. He thought that, upon the whole, the hope might fairly be expressed that the Christmas half year would show a considerable increase over that with which they were then dealing. The expenditure had increased by £4631, of which rates and taxes accounted for no less than £3645; the respective figures being £21,316 at Christmas, against £24,961 for the past half year. Pumping and engine charges showed an increase of £2525, in consequence of the advance in the cost of coal and through more pumping having been carried out. In management there was an increase of £2400, principally in law and surveyors' charges. As he had often stated, and as the proprietors were quite aware, the policy of the Directors had never been to stint or curtail proper and justifiable expenditure on maintenance. To keep the whole of the working plant in the highest state of efficiency had always been regarded by them as the first consideration; and hence it was that the Company would shortly hand over to the Metropolitan Water Board works and plant which ought to prove highly satisfactory. On the whole, he thought he might give the proprietors the full assurance of the Directors that the latter would be perfectly satisfied with the present position of the business, as well as that in prospect, were the Company to remain as a going concern, instead of being compulsorily acquired by the newly-created authority, the Water Board. This brought him to the subject of transfer alluded to in the report, in which the Directors stated that the Company's claim was prepared on the best advice, and desposited with the Court of Arbitration on May 16, under the order of that tribunal. On the 29th of May the Court held their first public sitting. Certain preliminaries were then considered and settled, and it was agreed that the Company's claim should be dealt with first; and on the 26th inst. they would proceed to establish their claim. The Court of Arbitration further directed, under their order of Feb. 28, that the Water Board should, on or before Aug. 17, 1903, deliver six copies of their answer to the claim marked No. 1—viz., that of the East London Company—and that such answer should set forth the amount of compensation which the Board were willing to pay to the Company, together with a concise statement of any relevant facts; and so on from week to week with respect to the claims of all the Companies. Accordingly, on the day named (Aug. 17), the Solicitors to the Water Board did send their answer to the claim of the Company. He did not intend at that meeting to analyze the terms of this document, but he thought he might just state that it was looked upon by unbiased judges as one of the most remarkable on record. It would be dealt with before the proper tribunal—the Court of Arbitration—and as the Water Board confessed themselves unable to state what sum they would be willing to give in respect of the undertaking, the Directors, with great confidence and satisfaction, left the solution of the problem to the determination of that tribunal, after the latter had heard the parties to the issue. The proprietors were aware of the agitation which took place on the Stock Exchange on the publication of the Water Board's answer; and he could only repeat the advice which was then given to the proprietors generally—not to be led away by panic, but to keep calm and to keep their stock. *Apropos* of this subject, he might allude to the following paragraph which appeared in "The Times" of Aug. 25:—

> A general feeling is expressed by those who are interested in London water stocks, and by others in the City, that neither the Boards of the Companies nor the newly-constituted Water Board are putting their respective cases before the Arbitrators in the best way. The Companies have, it is remarked, done themselves no good in the eyes of impartial persons by making claims which go beyond what even the most sanguine holders of the stocks dreamed of; and, on the other hand, the Water Board, by its reply to the East London Company, that it will offer nothing for that Company's ordinary stock, is too plainly carrying on the old fued which existed between the Company and the London County Council. The Arbitrators, who, we may remark, enjoy the entire confidence of all parties, are not likely to be impressed by extravagant claims in either direction; but it is unfortunate that the new Board should so early in its career have adopted an attitude on an important question of finance, which is likely to prejudice it in the eyes of investors and men of business generally.

If the Directors had erred, as the writer seemed to suggest, in making too heavy a claim for compensation, the Court of Arbitration would, of course, reduce it; but their fault—if fault there were—was very insignificant compared to the *non-possumus* attitude adopted by the Water Board. He would conclude by quoting his observations on April 2: "The Directors are convinced that they have a very good case. The Company is a sound and prosperous one as it stands, with a valuable prospective business, for the carrying on of which they have efficient plant; and they are confident that the proprietors need be under no apprehension as to the result." He then proposed the adoption of the report and accounts, and the payment of a dividend at the rate of 8 per cent. per annum (less income-tax) on the ordinary stock for the half year ending midsummer last.

Sir HERBERT BARNARD seconded the motion, which was at once carried unanimously.

The proceedings then terminated.

Electric Lighting in Leeds.—An inquiry into the application by the Leeds Corporation to the Local Government Board for sanction to borrow £220,000 for electric lighting purposes was conducted on Thursday, at the Leeds Town Hall, by Colonel A. G. Durnford, R.E., one of the Board's Inspectors. The Town Clerk (Mr. W. J. Jeeves) said the proposed expenditure would, it was expected, be sufficient for the ensuing three years. The average annual expenditure for the next three years had been estimated at about £70,000; but it was thought that this would be within the mark, so that they might have to make a further application for borrowing powers before the specified term had expired. If, when this sum had been spent, there should be any expenditure to which the Board took exception, it could be deducted from the new loan for which sanction would be asked. This concluded the inquiry.

EDINBURGH AND LEITH GAS COMMISSION.

Reduction in the Price of Gas.—The Salary and Appointment of Mr. W. R. Herring.

A Meeting of the Edinburgh and Leith Gas Commission was held on Monday, the 28th ult.—SIR JAMES STEEL, Bart., in the chair.

The Works Committee reported an increased output of gas during August of 5,426,000 cubic feet, as compared with the same month of last year. They also reported that all the gas is being made at the Granton works, which were restarted in proper order on Aug. 17; and that the Edinburgh works were closed on Sept. 9. The same Committee reported that, having considered the estimate by the Treasurer of the revenue and expenditure of the Commission to May 15, 1904, they agreed to recommend the Commissioners to supply gas of from 24 to 26 candle power, and to charge therefor to the ordinary meter consumers within the municipal boundaries of Edinburgh and Leith at the rate of 2s. 9d. per 1000 cubic feet, subject to the present rates of discount; consumers of gas outside the boundaries to be charged at the price of 3s. 3d., also subject to present rates of discount—these charges to take effect after the October-November survey, and to continue in force for a year. Consumers by prepayment meter to be charged at the present rate.

These recommendations were adopted.

The minutes of the Works Committee of Sept. 14, contained the following paragraph: "In recognition of the services of Mr. Herring in connection with the erection of the new gas-works at Granton, and the economies resulting therefrom, and otherwise, it was resolved, on the motion of Lord Provost Sir James Steel, Bart. (Edinburgh), seconded by Provost Mackie (Leith), that his salary, as from the 15th prox., should be advanced to £1500, on the understanding that he would undertake to continue as the Commissioners' Engineer for at least five years from that date. Bailie M'Kelvie dissented."

When this portion of the minutes was reached, Mr. Herring left the room.

Sir JAMES STEEL moved its approval. He said they were fortunate in having the services of such an able man as Mr. Herring; and he thought they did well in securing a continuance of them. There was still a large amount of work to be done at Granton. Mr. Herring knew the entire thing; and he thought that, on the whole, they ought to show their appreciation of his services by advancing his salary by the £300 proposed.

Bailie BRYSON (Leith) seconded. Mr. Herring had done good service in connection with the erection of the new works. They were only proposing what was just to him. Had they employed an outside man, they would have had to pay him at least 2½ per cent. on the cost, which worked out at about £15,000. This was a good deal more than was in their proposal.

Bailie M'KELVIE (Leith) said that this matter had been suddenly sprung upon them; and the reasons stated there were not the reasons which were set forth at the meeting of the Committee. It was not a correct minute. While he had as high an opinion of the ability and work of the Engineer as any member of the Commission, he thought they should be just before they were generous. In the present depressed state of trade, the increase was unwarranted and unjustifiable, and, he thought, a great public scandal. He was only expressing this as his opinion. Mr. Herring was appointed in 1897, at a salary of £900. Two years after, for the reasons stated in that minute, he was given an increase of £300. Then Granton House was put in order, at a cost of £1400, and given to Mr. Herring as a private residence, with free taxation, coal, and gas. In 1901, on the statement that the large grounds and gardens at Granton House made the place a white elephant to the occupier, a further sum of £110 was voted for the payment of gardeners' wages. This brought up the present salary, without any exaggeration, to over £1500 per annum. With regard to the proposed advance, the reason stated at the Committee meeting was, he thought, the real one. Previous to the meeting, Mr. Herring button-holed certain of his friends in the Commission, and asked the question whether he had reached his maximum, and—incidentally he supposed—mentioned that he had been asked to send in an application for the post in Glasgow. Immediately the question was asked, What is Glasgow offering? It was stated to be £1500; and a motion was then made and carried that Mr. Herring be granted the increase. In his opinion, £1200 a year in Edinburgh was better than £1500 a year in Glasgow, where there was double the population, with increased work and responsibility. For these reasons, he moved a direct negative or the previous question.

Mr. DOUGLAS seconded, but on different grounds. The proposal had come to him as a great surprise. No commissioner admired the ability of Mr. Herring more than he did. He had upheld Mr. Herring at every stage; but he thought it was their duty to call a halt before proceeding further. He would suggest that the Commission should not grant the increase, but should appoint a Committee to enquire into the matter. He would not go the length of Bailie M'Kelvie, and make strong statements.

Bailie M'KELVIE said his statements were made with every respect for Mr. Herring, but in the interests of the Commission. His reflections were on the Committee.

Sir ANDREW M'DONALD rose to a point of order. He, as a member of the Committee, decidedly repudiated that they had done anything of the nature of a scandal in agreeing to advance Mr. Herring's salary. He wanted that distinctly made clear. They, as business men, understood what they were doing. They were not carried away by anything. Evidently it was thought that the matter did not have due consideration; but it had had very careful consideration. As to its being a scandal perpetrated by the members of the Committee, he objected to this altogether. Bailie M'Kelvie had shifted his ground.

Sir JAMES STEEL said that was so. He had shifted it on to the Committee, and said it was a scandal on their part. Did he adhere to that?

Bailie M'KELVIE said he did.

Bailie BRYSON said it was a vote of censure on the Committee.

Sir JAMES STEEL said it was; and the Committee repudiated any such statements as were made by Bailie M'Kelvie.

Mr. DOUGLAS (continuing) said he was not aware that the subject had been before the Committee; but on principle he objected to the increase.

Sir JAMES STEEL: You are seconding, whether you know if it be right or not.

Mr. DOUGLAS thought such a matter ought to be duly considered.

Bailie GRIEVE said it was unfortunate that Mr. Douglas had seconded the amendment, because the matter was thoroughly considered by the Committee; and one of the reasons the proposal was agreed to was that there was an understood arrangement that, owing to the large amount of work Mr. Herring had carried through, something ought to be done to recognize his services. There had been no extra engineer or architect employed in the erection of the new works. It had all been carried through by Mr. Herring, and carried through under the original estimate, which was a thing that seldom occurred with new works of such magnitude. It was also understood, he thought, that, by increasing Mr. Herring's salary by £300, nothing further would be done in the way of an honorarium.

Mr. STEWART said no reason was given for the increase. He thought they ought to go into the question fully, and give the true reason. It was stated that Mr. Herring had another situation practically in his hands. They had no time to make inquiry as to that; but he had seen some gentlemen belonging to the place, and was told that there was no certainty at all in the matter. In regard to salary, the situation was advertised, he understood, without any figure at all. He thought, therefore, it was a question whether they should not consider the matter a little fuller than they were doing.

Sir JAMES STEEL said the question of salary was considered very fully; and in his opinion they were almost bound, in honour, to do something in the way of recognizing Mr. Herring's great services to them, as Engineer for these large works. This was what weighed with himself. He thought the best course was to raise Mr. Herring's salary, and get him to continue with them for a considerable time. Having a good servant, they should pay him a handsome salary.

Bailie GIBSON supported the Committee's recommendation. There should be no dubiety about the matter. He stated in Committee that it weighed with him very much that the matter of any consideration which might have been ever thought of to the Engineer, for carrying through the works at Granton, would be finally settled by this increase. He felt that in this proposal they were getting rid of a question which was going to excite a good deal of discussion, and probably difficulty in the Commission. They were only doing what was fair and right to Mr. Herring in this matter. The question of other emoluments had been referred to by Bailie M'Kelvie. His own impression was that residence in Granton House could be considered of no great benefit to anyone who had to occupy it, because of the great expense which had to be incurred in keeping it up. Mr. Herring had to live there for the convenience of the Commissioners, to be near his work. He was very sorry that Bailie M'Kelvie had made use of such a strong expression in regard to the action of the Committee; and he, for one, repudiated any such statement.

Mr. A. A. MURRAY thought it would have been sufficient if they had replied to the question of whether they considered that Mr. Herring was at his maximum. He did not see that there was any call upon them to increase his salary by £300.

The recommendation of the Committee was adopted by 14 votes to 4.

LEICESTER GAS, ELECTRICITY, AND WATER SUPPLY.

At the Meeting of the Leicester Town Council on Tuesday, the Gas and Electric Lighting Committee reported that the net profits of the gas undertaking for the half year ending the 30th of June, were £23,255. Out of this sum, £9249 had been paid into the sinking fund; leaving a balance of £14,006 to be applied at the end of the financial year, in March next, as the Council might direct. The Committee further reported that the working of the electric light undertaking in the above-named period had resulted in a net profit of £3847, out of which £2545 had been paid into the sinking fund; leaving £1302 to be carried forward. The Committee expressed their pleasure in reporting the completion of the electric light station at the Aylestone Road works.

Mr. EDWARDS, in moving the adoption of the portion of the report relating to the financial statement of the Gas Department, said the results of the half-year's working had been very satisfactory. There were four items responsible for this. In the first place, the consumption had increased something like 5½ per cent, which amounted to about 50 million cubic feet of gas. They had also obtained higher prices for residuals, and had had cheaper coal. Moreover, they had had the advantages of perfect plant. It was often said that the retort-house in every gas-works was the cash-box of the undertaking; and their retort-house, thanks to the skill of their Engineer (Mr. Alfred Colson, M.Inst.C.E.), was perfect. They had obtained 11,000 cubic feet of gas per ton of coal, which was an increase of more than 1000 cubic feet on the average throughout the country. They had paid more in rates than in the corresponding period of last year; and if they spent money in this way they could not pay it to the Finance Committee as profit. They had also paid £3511 more into the sinking fund; this having arisen partly through an error made some years ago. They had a loan which they considered to be a temporary one, and they paid interest upon it, but no sinking fund. They had since discovered that they ought to pay into a sinking fund also; and they had therefore decided to pay the whole of the money due, and start clear next half year. Upon the basis, therefore, of last year's trading they had made a profit of £6000 more than they showed. They promised the Finance Committee £20,000 this year. They would far exceed their promise; and the profits for the present year would be a record for the department. He was sure this would be very gratifying to the Council and to the ratepayers at large.

Mr. FLINT seconded the motion.

Mr. SQUIRES called attention to the fact that no assets were mentioned in the accounts.

Mr MANN remarked that the reserve fund of £6000 was too small for so large an undertaking as the gas-works.

Mr. EDWARDS agreed with the last speaker, and said perhaps it would have been well to have added to the reserve instead of handing money over to the Finance Committee. With regard to the remark of Mr. Squires, the assets were the gas-works, which would easily realize £2,000,000, or £1,000,000 profit.

The MAYOR (Alderman Vincent), in putting the motion, agreed with the remarks as to the reserve fund being too small, and expressed the hope that in the near future it might be possible to increase it, as any serious calamity at Aylestone would be a matter of great importance.

The motion was agreed to.

Mr. EDWARDS then moved the second portion of the report, relating to the electric light undertaking. He remarked that, though they had done a larger business during the half year than in the corresponding period of the previous year, their profits had been less. The increase in business was something like 20 per cent.; and the profits were less by £716. The decrease was due to the rise in rates under the new assessment, otherwise an increase would have been shown. To some extent in the past the Gas Department had "nursed" the electric light undertaking; but now the latter had been put on its own basis. He was pleased to report that the extensions to their works had been completed. They now had one of the finest stations in England. They had plant sufficient for doing a largely augmented business; and though they were looking forward to an increase, they did not expect to have to do anything to the plant in the near future.

The motion was carried.

The Water Committee reported that the accounts for the half year ending the 30th of June showed a net profit of £11,081, out of which £3411 had been paid into the sinking fund; leaving a balance of £7670. It was proposed to carry this amount at the end of the financial year to the credit of the special water fund created under the authority of section 164 of the Derwent Valley Water Act; and the Committee recommended the Council to approve of this course. Reference was made in the report to certain proposed deviations from the Leicester section of the works authorized by the Derwent Valley Water Act, 1899, particulars of which were given.

Alderman WOOD moved the adoption of the report; pointing out that the Committee had made a profit of nearly £700 more than in the corresponding period of last year. With regard to the alterations in connection with the Derwent Valley scheme, he said that financially they made very little difference to the original cost, while they would effect an improvement on the plans first prepared.

The motion was unanimously agreed to.

DEVONPORT CORPORATION GAS UNDERTAKING.

Development of the Stove and Automatic Meter Business.

A proposal that application should be made to the Local Government Board for sanction to a loan of £45,000 has been submitted by the Gas Committee to the Devonport Town Council. The proposed loan represents the Committee's estimate of the expenditure during the next five years on the purchase of stoves, meters, and automatic installations.

Mr. W. HORNBROOK, the Chairman of the Committee, in moving the adoption of the report, said the gas undertaking was making rapid progress. In his opinion, the amount of the loan should be £65,000; but, in deference to the wishes of members of the Committee, it was decided to limit the sum to £45,000. It was more than probable that at the end of the five years they would have to ask for further borrowing powers. Members of the Council must consider the matter as purely a commercial transaction; and they would see that it was a very profitable one. They did not intend to spend a penny of the money until there was a demand to warrant it. In supplying stoves to customers, they were not embarking on a speculation. If the demand did not come, they would not spend the money. Since they acquired the gas-works, they had spent £12,000 on stoves and the fitting up of houses for the prepayment system; and they would be able to show the Local Government Board that there was a growing demand which warranted further borrowing powers. While the repayment of the loan would be spread over ten years, the stoves would last about twenty years.

Mr. R. H. RENDLE moved that the matter be referred back to the Committee. He said that, though originally opposed to the purchase of the gas-works, he believed that it was the duty of all of them, now that they had possession of the undertaking, to make it a complete success. If they overburdened it with capital, it would militate against that success. The Gas Company had a capital of only £64,000, besides a mortgage of £14,500. The Corporation paid £149,000 for the works, in addition to taking over the mortgage, and had obtained power in their Act to borrow £100,000. By the time this money was spent, the capital account would amount to about £270,000. Would the undertaking stand such a large expenditure?

Mr. FORD: Yes; over and over again.

Mr. RENDLE said he was not opposing for the sake of opposition; but it seemed to him that the Corporation were spending money recklessly on the gas-works.

Mr. HORNBROOK said the proposed new capital expenditure would earn a profit of from 10 to 12 per cent., out of which they would have to pay the interest and sinking fund charges.

There was no seconder to the amendment, and the Committee's recommendation was adopted.

The Directors of the South African Lighting Association declare an interim dividend of 4 per cent. (8 per cent. per annum) in respect of the half year ended the 30th of June.

PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

Portions of the Evidence Abstracted.

Fourth Day—July 2.

Mr. R. BARROW, Comptroller and Auditor of Accounts for Liverpool.

Further evidence on the subject of account-keeping was given by Mr. Richard Barrow, the Auditor of Accounts for Liverpool, who appeared before the Committee at the request of the Association of Municipal Corporations. Having explained fully the system in vogue in his city, as well as other large places, he referred to the allocation of profits on the tramways. The Act authorizing the transfer of the undertaking in 1897 prohibited the Corporation from applying any portion of the profits in aid of the rates until the year 1912; but owing to the very satisfactory results of the working, the Corporation, in 1901, felt that it would not be unreasonable that the ratepayers should have something out of the undertaking—due regard being paid to its solvency and efficiency. They accordingly approached Parliament, with the result that in the following year they authorized the transfer of net profits in excess of £30,000 in relief of the rates, provided that the amount transferred should not in any year exceed one-third of such net profits. Last year's profits amounted to £75,000, of which £25,000 was applied to the relief of rates, and £50,000 went to the renewal, reserve, and depreciation account. The policy of the Corporation was actuated by the feeling that it was hard upon the ratepayer of the moment to get no advantage out of the remarkably large profit that the tramways were earning. The undertaking was made to pay establishment charges. Before arriving at the profit, a payment of £1700 was made to the Finance Committee in respect of the salary of the Town Clerk, himself, and other officers.

Passing to the electricity works, witness said that these were purchased in 1896; and the result of last year's working was a surplus of £33,415, after providing for sinking fund. Of this sum, £12,029 was transferred to the relief of the rates, and £21,386 to the reserve and renewal account. Until 1901, nothing was transferred from the profits of the undertaking in aid of the rates. Since the works were taken over from the Company, the price of current had been steadily reduced. The undertaking also paid a proportion of the salaries and administration expenses; the amount so charged last year being £2000.

On the subject of depreciation, Mr. Barrow said he thought it was the duty of the financial advisers of corporations to obtain all possible information from the sources which were open to them as to the life and character of an undertaking, so that they might form a trustworthy opinion, so far as laymen could, of its nature. As an illustration, he mentioned the method which he adopted with regard to the proposal to transfer a portion of the tramway profits. He consulted the Electrical Engineer, the City Engineer, and the General Manager; and he not only obtained from them the facts within their experience, but he obtained from other sources the facts and experiences of other municipalities and other trading undertakings as to the prospective liability there would be in respect of the concern then under consideration. This was a duty which he thought was discharged by the financial advisers of corporations. He was afraid that Mr. Sherley-Price was scarcely in a position to deal with the question of depreciation from the point of view of a municipal corporation. Mr. Sherley-Price admitted in the course of his evidence that he did not know anything about sinking funds; but sinking funds and depreciation were inseparably connected—the one could not be considered without the other. The sinking fund was based upon the period determined either by the Local Government Board after due inquiry or by a Parliamentary Committee. The Parliamentary Committee received reports from Government Departments, including the Local Government Board; and the Board frequently made representations as to the periods asked for in Private Bills for the repayment of loans. Therefore he believed that, directly or indirectly, the Local Government Board had sanctioned or approved of the periods for which loans had been allowed. It might be taken for granted that the Board were advised by competent engineers, who had satisfied themselves as to the life of the undertaking that might be under consideration. Mr. Sherley-Price could not deal with the question of sinking funds, because he had had nothing to do with them; they did not appear in the accounts of private undertakings. Therefore, to a considerable extent, sinking funds in corporation accounts took the place of depreciation funds in private undertakings. Then, in regard to the question of depreciation, an undertaking, he submitted, could not be considered in detail—it must be looked at as a whole. The attention of the Committee had been directed to the fact that a portion of the plant of an undertaking might be suffering either from obsolescence or from rapid depreciation; but if the whole of it was pooled, experience went to prove that the periods sanctioned by the Local Government Board corresponded very closely with the life of the undertaking. If this was correct, he did not think a local authority could be said to be neglecting to do something which they ought to do by not providing otherwise for depreciation. Assuming, however, for the sake of argument, that the period for which the loan was sanctioned did not correspond with the life of the undertaking, and that there was a loss on the year's working after allowance had been made for depreciation, then he did not think that it would be reasonable to say that the ratepayers of this year should provide a sum as a set-off against depreciation which was only theoretical, which had not yet been ascertained, and which might not be necessary. The early years of electrical supply undertakings were very frequently not prosperous ones, because prices were high; and therefore it seemed to him that at the commencement of the business it would not be a reasonable thing to make such provision out of the rates. If, however, there was an ascertained loss at the end of any year, the municipality ought to deal with this out of the rates at once, and not charge it to the undertaking so as to make it up out of the surplus in a subsequent year. He believed that municipal trading was beneficial to the community within the limits which characterized the powers of corporations generally in this country.

Questioned by Mr. Joyce, witness said the gross amount of money from all sources in Liverpool that went to the relief of the rates last year was about £37,000—that was, £25,165 from the tramways, and £12,000 from the electricity supply. The Corporation were prohibited from making a profit on the water-works. This fact should be remembered when drawing conclusions from Sir Henry Fowler's return as to remunerative municipal undertakings. Any surplus there might be on the year's working of the Water Department had to be applied to the reduction of expenditure and the charges upon the rates in the succeeding year. The acquiring of light, water, transit, and so on, by the Liverpool Corporation had undoubtedly been the means of cheapening these things to the general public. In the case of Liverpool, where the revenue was a large one, he thought it was prudent, though not absolutely necessary, to provide a depreciation fund. He would have no objection to a municipality being required to give a statement in their accounts of the basis on which their depreciation fund was managed; but he did not know of any corporation who adopted this course.

Mr. WALTER G. FLOYD, Elective Auditor for Birmingham.

The next witness was Mr. Walter G. Floyd, Elective Auditor for Birmingham, who also appeared before the Committee in 1900. His evidence naturally turned on the subject of the accounts which it is his duty to examine. He commenced by remarking that he had very good grounds for saying that in Birmingham the different Committees made the accounts appear exactly as it suited their own purposes. A member of the Electricity Committee had stated at a public meeting that his department had made a profit, but they did not show it because they were afraid the consumers would want their electric light cheaper. Of course, it was possible to make an account appear better than it really was by passing to capital account items of expenditure which ought to appear in the revenue account; and, in his opinion, in Birmingham the different accounts were passed to capital to suit circumstances. For instance, if they compared the last two accounts of the Gas Department, they would see, taking the price of coal for the last year and the amount of gas and residuals sold, they made a profit of £80,000 more than in the previous twelve months; and they only showed in their profit a difference of some £20,000. This was done by juggling; the accounts gave good presumptive evidence that it was done by manipulation of the figures. He pointed out that, whereas they charged in 1902 £92,000 for repairs and renewals, this year, when they made the very much larger profit, they charged £41,000 more for the same thing, although wages, &c., remained the same; and they passed a very much smaller amount to the capital account—£42,000 in place of £70,000. The natural conclusion to be drawn from these figures was that they had been made to suit the particular case. From £92,000 to £133,000 for repairs and renewals was an enormous jump in one year. He did not say the figures were not justifiable; but they would certainly call for inquiry in the case of an auditor who took any interest in the concern. Witness then gave some figures relating to the Gas Department for the last nine years. During this period, he said, there had been passed to capital on account of expenditure in extension of buildings, manufacturing plant, storage works, and structures a sum of £492,128; new mains, £65,159; new meters in place of old ones, £106,990; and land acquired, £19,396—making a total for the nine years of £682,674. These items were not inspected by the ordinary auditors. The figures were arranged by the Committees with the City Accountant's Department of the Corporation. In this way, any trading Department could place to capital account whatever sum it pleased. No doubt the Committees concerned would discuss the question with the Accountant's Department; but the latter would in all probability adopt the recommendation of the Committee. It was impossible for him to speak of this matter of his own knowledge. No auditor ever called these accounts in question; and from inquiries he had made, it appeared that the course of procedure was as he had stated.

In reply to the Chairman (the Earl of Crewe), witness said the remuneration he received as Elective Auditor would be totally inadequate, if he did the audit thoroughly. All he did was to see that the Treasurer had obeyed the orders of the different Committees. He did not think this system of auditing was worth anything. The accounts prepared by the Treasurer and his staff were perfectly kept; and they were gone over by the Official Auditors before he (witness) checked them. It was only with regard to the allocation of certain sums that there ought to be inquiry by someone with power to deal with them. His opinion was that the best system would be for the Government to appoint the different auditors for the different municipalities. He did not believe in a Local Government Board audit.

The duty of such auditors, witness went on to explain, should be not only to ascertain the mathematical precision of the accounts, but to go thoroughly into the matter of the amounts carried to capital or charged to expenditure; and whenever they noticed that a larger amount was passed to capital account, they should specially concern themselves with inquiring why this was done. He did not consider that the existing figures, representing the capital standing to the credit of the Corporation of Birmingham, were justified by the facts. They had given such enormous sums for the undertakings, that he did not believe the figures represented the value at all. If they were a limited company, the figures could not stand; they would in many cases have to be decreased. Take the amount standing to the capital of the Water Department, for instance. When the Corporation applied for money to carry out the Elan water scheme, their estimates came out at £5,500,000. The scheme was divided into two parts—first one line of pipes was to be laid, and then another. The estimates given for the first part of the work were £3,300,000, and for the second portion £2,200,000. The Corporation had at present on the first instalment exceeded the whole amount applied for, on account of the enormous sums paid for land and compensation; and they had had to go to Parliament for additional powers to borrow £1,500,000 to enable them to complete the first part of the scheme. The second portion was a matter for the future to deal with. The whole of the money for the two schemes was not sufficient to carry out the first instalment. He quoted this in support of his belief that the amounts represented by capital were not justified by the facts. It was stated by Mr. E. O. Smith, when giving evidence before the Committee in 1900, that there was a reserve amount of £120,000 to fall back upon in connection with this water scheme; and that the additional rentals, together with this

reserve, would be sufficient to meet the interest and expenditure on the scheme, so that the work would be carried out without casting any extra burden upon the ratepayers. Last year the whole of the £120,000 was exhausted; they made a loss of £80,000 on the water scheme; and they had to go to the City Treasurer for a sum of £43,000, and make a 4d. rate to meet the payment. There was a very strong body of opinion against municipal trading in Birmingham; but they were not strong enough men to bring the matter forward.

Sir James Woodhouse closely pressed witness with regard to his assertion that the Birmingham gas accounts furnished presumptive evidence that the figures had been juggled with. Sir James pointed out that this was a serious allegation to make, and expressed a desire to get to the bottom of the matter. Witness said he had not himself found any juggling; all he maintained was that there was presumptive evidence. He had already stated that a city councillor openly said at a public meeting that there had been a profit made in the Electric Supply Department which had not been disclosed because they thought the people would want the light cheaper. He contended that this was evidence; one of the members of their own Committee had stated that they had juggled with the figures. The councillor referred to was Mr. Jephcott; and the speech was made a year ago last November. Further pressed to point out what the presumptive evidence was to which he had alluded, witness replied that the Gas Committee had made a profit on the price given for coal, and the supply of gas and residuals produced from it, last year of £80,000 more than in the previous year. The cost of coal was £366,000, as compared with £423,000; while the sale of gas and residuals produced £705,000, as compared with £686,000. They had therefore paid £57,000 less for coal last year, and received £19,000 more for the products. This matter (as he had already remarked, when pointing out that a difference of some £20,000 only was shown in the profits) needed inquiring into. There was apparent juggling; but it might possibly be explained. It was not a surprise to him to know that coal cost more in the year ending March, 1902, than in that ending March, 1903; but it was a surprise to him to find that the Committee made £80,000 more out of the products of that coal, when they only showed some £20,000 more in their profits in the balance-sheet. The profit balance given for the year to March last was £56,920; while that for the previous twelve months was £31,557—a difference of £26,000. He did not challenge the accuracy of this profit; but he did maintain that it showed there was a necessity for inquiring into the figures. When stating that companies' accounts would show something very different from the Birmingham Corporation accounts, he meant that a company would have a valuation of their assets, while the Corporation had none—the expenditure account was simply put down as capital, and it was utterly unreliable.

Mr. Powell-Williams next took witness in hand somewhat vigorously, asking him if he insinuated that there was any juggling with the Corporation accounts. Witness replied that he would insinuate that the figures were made to suit certain purposes at different times; he made no definite charge. He would, however, challenge the sum of £134,000 charged to residuals, and ask for an explanation of it. Mr. Powell-Williams: "Then what do you mean by saying in answer to a previous question that you challenged nothing?" Witness: "I say I will challenge it now, owing to the pressure brought to bear upon me." Continuing, he admitted that, with regard to the gas accounts, he called in question certain items of charge as between capital and revenue. He did not mean to insinuate that, supposing his suspicions were correct, what had been done had been done wilfully, but simply as people often did in discussion—say that it would be wiser not to carry such a big amount to capital this year as they did last year. He thought under these circumstances they very possibly did not disclose the exact state of profit made last year in the accounts. Mr. Powell-Williams: "Do you wish to tell this Committee, with regard to the accounts of the Gas Committee of Birmingham, over which Mr. Howard Smith [the Auditor appointed by the Corporation] and his firm have been in every detail, and as to which he has put his own hand to a certificate certifying that they are correct, that he did not know what he was about?" Witness: "Certainly not." Mr. Powell-Williams: "Then what do you mean by the insinuation that a proper allocation has not been made between capital and income in respect to the gas account?" Witness: "He would not be consulted in the matter; the accounts would be all prepared and placed before him." The reason for his stating that the assets of the Birmingham Corporation were over-valued was the enormous prices they gave for things. If he paid £100 for a watch worth half-a-crown, and passed that over to capital account, the capital account would not be correct. Mr. Powell-Williams: "Do you mean to tell this Committee that the Corporation, knowing perfectly well that they have given a great deal more than the value for any particular item which appears in the accounts, are deliberately publishing it from year to year, in the teeth of the Auditor, as being of extra value?" Witness: "They appear as capital when they are not worth the money." Mr. Powell-Williams: "Do you not know that is fraud?" Witness: "No, I do not. I should say it is not fraud." Mr. Powell-Williams: "Do you not know that if one of the directors of a company were to do anything of that kind, he would render himself liable to a charge of fraud?" Witness: "Yes; but corporations have neither souls to be saved nor bodies to be kicked." Witness went on to say that he had not taken much pains to examine into the value of the assets of the Corporation item by item; but he knew the estimates for work in the Water Department were £3,300,000, while the cost was £5,500,000; and those amounts had been passed to capital. The original estimate was made by Mr. Mansergh. Everyone knew that, as soon as corporations desired to buy certain lands or property, the price demanded ran up enormously; and they ultimately gave very much greater sums than they were worth. Mr. Jacobs had stated in the Birmingham Council Chamber that the Corporation had given for land at Frankley £120,000, after it had been in the public market for £40,000 without finding a purchaser. He entertained no suspicion whatever of the Corporation's honesty and straightforwardness of purpose; but he did say they made statements of accounts to suit certain circumstances. He thought that, when a

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 23.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	April 17	10½	Alliance & Dublin 10 p.c.	19½ - 20½	..	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	May 14	6½	Bombay, Ltd. . . .	5¾—6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 7
380,000	Stk.	Aug. 13	12	Brentford Consolidated	235—240	..	5 0 0
300,000	,,	,,	9	Do. New . . .	173—178	..	5 1 1
50,000	,,	,,	5	Do. 5 p.c. Pref. .	150—135	..	3 14 1
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	105—110	..	3 12 9
220,000	Stk.	Sept. 11	10⅝	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7½	Do. A. Ord. Stk. .	145—150	..	5 3 4
460,000	20	Mar. 31	10	British.	39—40	..	5 0 0
103,000	Stk.	Aug. 13	6	Bromley, Ord. 5 p.c. .	115—120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c. .	88—93	..	4 16 9
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	10⅝—11¼	..	6 4 5
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 10	8½	Cagliari, Ltd. . . .	2—2½	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Aug. 27	5⅛	Commercial 4 p.c. Stk.	105—108	..	4 16 3
503,750	,,	,,	5	Do. 3½ p.c. do.	99—102	—1	4 18 0
442,947	,,	June 11	3	Do. 3 p.c. Deb. do.	87—90	..	3 6 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	120—125	..	5 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	135—140	..	5 0 0
575,000	Stk.	Aug. 27	5⅛	Crystal Palace Ord. 5 p.c.	112—117	..	4 11 1
60,000	,,	,,	5	Do. 5 p.c. Pref. .	118—123	..	4 1 4
111,533	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135—138	..	3 12 6
486,090	10	July 29	10½	European, Ltd. . . .	17½—18½	..	5 13 6
354,060	10	,,	10½	Do. £7 10s. paid	12½—13½	..	5 16 8
15,243,200	Stk.	Aug. 13	4⅛	Gas-light and Coke { 4 p.c. Ord. . .	84—86	+1	5 2 4
2,600,000	,,	,,	3½	{ 3½ p.c. max. .	85—87	+1	4 0 6
3,799,735	,,	,,	4	{ 4 p.c. Con. Pref.	104—107	+1	3 14 9
4,193,975	,,	June 11	3	3 p.c. Con. Deb.	87—89	..	3 7 5
2,8,,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	June 11	8	Hongkong & China, Ltd.	15—16	..	5 0 0
3,800,000	Stk.	May 14	10	Imperial Continental .	198—203	+3	4 18 6
473,603	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.	99—102	..	3 8 7
165,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	113—118	..	5 1 8
561,000	Stk.	,,	10	Liverpool United A .	214—216	..	4 12 7
718,100	,,	,,	7	Do. do. B .	162½—4½	..	4 5 1
306,083	,,	June 26	4	Do. do. Deb. Stk.	110—112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd. .	4¾—4⅞	..	5 5 3
560,000	100	Oct. 1	5	Met. of { 5 p.c. Deb.	101—105*	..	4 15 3
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	100—102*	..	4 8 3
541,920	20	June 11	3½	Monte Video, Ltd. . .	9—10	..	7 0 0
1,515,892	Stk.	Aug. 13	4½	Newc'tle & G'tesh'd Con.	103¾—104¾	..	4 6 2
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.	98—99	..	3 13 8
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	140—145	..	5 10 4
600,000	5	Sept. 30	7	Ottoman, Ltd. . . .	5—6*	..	5 16 8
					* Ex div.		

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
205,005	Stk.	June 26	6⅝	Ply'mth & St'house 5 p.c	123—128	..	4 15 8
851,070	10	April 30	7	River Plate Ord. . .	11¼—11⅝	..	5 19 2
300,000	Stk.	June 26	4	Do. 4 p.c. Deb..	94—96	..	4 3 4
250,000	10	Sept. 30	8	San Paulo, Ltd.. . .	11—12*	+¼	6 13 4
135,000	Stk.	Sept. 11	10	Sheffield A	235—238	+1	4 4 0
209,984	,,	,,	10	Do. B	233—236	+1	4 4 9
523,498	,,	,,	10	Do. C	233—236	+1	4 4 9
103,235	Stk.	Sept. 30	5	Shrewsbury Ord. 5 p.c.	109—112*	+½	4 9 3
6,150,000	Stk.	Aug. 13	5⅛	South Met., 4 p.c. Ord.	115—118	..	4 10 2
1,780,000	,,	July 10	3	Do. 3 p.c. Deb. . .	87—89	..	3 7 5
380,940	Stk.	May 14	5	Southampton Ord. . .	105—110	..	4 10 11
87,950	,,	July 10	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 27	6	Tottenham and Edmonton { A. 5 p.c.	115—120	..	5 0 0
313,020	,,	,,	4½	{ B. 3½ p.c.	95—100	..	4 10 0
182,380	10	June 11	8	Tuscan, Ltd.. . . .	8—9	..	8 17 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
737,142	Stk.	Aug. 13	5	West Ham, 5 p.c. Ord.	93—98	..	5 2 0
				WATER COMPANIES.			
780,776	Stk.	June 26	11½	Chelsea, Ord. . .	305—315	..	3 13 0
150,000	,,	,,	5	Do. 5 p.c. Pref. .	147—150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	132—137	—2	3 5 8
175,785	,,	Sept. 30	4½	Do. 4½ p.c. Deb. .	135—140*	..	3 4 4
1,720,560	Stk.	Mar. 31	8	East London, Ord.. .	208—213	+3	3 15 1
654,740	,,	June 11	4½	Do. 4½ p.c. Deb. .	138—143	..	3 2 11
1,282,943	,,	,,	3	Do. 3 p.c. Deb. .	92—95	..	3 3 2
700,000	50	June 11	10	Grand Junction { 10 p.c. max..	122—127	..	3 18 9
310,000	Stk.	Sept. 30	4	{ 4 p.c. Deb..	120—125*	—1	3 4 0
708,000	Stk.	Aug. 13	10½	Kent	275—285	..	3 13 8
160,000	,,	,,	7	Do. New, 7 p.c. max..	190—200	..	3 10 0
1,043,800	100	June 26	11	Lambeth, 10 p.c. max..	292—297	..	3 14 0
406,200	100	,,	8½	Do. 7½ p.c. max..	210—220	..	3 17 3
350,000	Stk.	Sept. 30	4	Do. 4 p.c. Deb..	120—125*	..	3 4 0
500,000	100	Aug. 13	12½	New River, New Shares	385—395	..	3 4 9
1,000,000	Stk.	July 29	4	Do. 4 p.c. Deb..	121—124	..	3 4 6
902,300	Stk.	June 11	7½	South-wark { Ord. . . .	220—230	—5	3 5 3
126,500	100	,,	7½	{ 7½ p.c. max.	210—220	..	3 8 2
489,200	Stk.	,,	5	and { 5 p.c. Pref. .	145—150	..	3 6 8
1,019,585	,,	Mar. 31	4	Vauxhall { 4 p.c. A Deb.	122—127	..	3 3 0
1,155,066	Stk.	June 11	10	West Middlesex. . .	270—280	+2½	3 11 5
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	133—138	—3	3 5 3
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb. .	92—95	..	3 3 2
					* Ex div.		

town councillor got up and stated at a public meeting that they had done so, he was justified in holding this opinion.

Mr. H. E. HAWARD, Comptroller of the London County Council.

Evidence on the subject of the raising of loans and the audit of accounts was offered by Mr. H. E. Haward, the Comptroller of the London County Council, who said that the Council's predecessors, the Metropolitan Board of Works, obtained powers to use the sinking funds for the purposes of their own capital expenditure. He considered this good finance; and the practice had been largely followed by various municipalities throughout the country. He had read the evidence of Mr. Astill given at the last sitting of the Committee [see "JOURNAL" for the 29th ult., p. 819]; and he desired to refer to his statements regarding the position of the County Council as the sanctioning authority for loans. Mr. Astill practically insinuated that the County Council had a pecuniary inducement to lend money to the Borough Councils, and consequently they did not pay very much attention to the propriety of the loans. He repudiated most strongly such a suggestion. The rate of interest that was fixed upon the loans was not arrived at with any idea of the Council making a profit on the transaction, but was put from time to time at such a figure as would reasonably guarantee the Council against any loss. On the whole, he thought the County Council were not dissatisfied with the existing system of Local Government Board audit. At any rate, he was not authorized to make a suggestion on their behalf with reference to this matter, except to say that they would like the accounts audited a little earlier. The accounts for the year to March 31, 1902, were not signed by the Auditor until Feb 28, 1903. This, however, was a little later than usual.

The completion of Mr. Haward's examination was adjourned till the following sitting of the Committee.

Sales of Shares.—At Berwick, ten £10 shares in the Berwick and Tweedmouth Gas Company were recently sold by auction for £19 5s. each. At the Public Hall, Harpenden, a few days ago, Mr. Anthony Cumberland offered for sale, in accordance with instructions received from the Directors, 200 £5 "C" shares (5 per cent.) in the Harpenden Water Company; being part of the capital authorized by the Order of 1899. The prices realized ranged from par to 5s. premium.

Removal of Obstacles at Oldham.—The Oldham Gas Committee, being of opinion that many persons are deterred from using gas because of the deposit of 10s. which they have to make before receiving a supply (and which is retained for twelve months, after which it is returned if the gas bills have been regularly paid), have decided that the amount shall be reduced to 5s. Another suggestion made by the General Manager (Mr. A. Andrew), that the charge of 1s. hitherto made for reconnecting a gas supply where it had been disconnected should be abolished, has also been agreed to. It has further been determined to make an attempt to popularize the use of incandescent gas-lights in mills, so as to obviate the installation of private electric lighting plants.

METROPOLITAN WATER BOARD.

The Board reassembled on Friday, after the recess, at the offices of the Metropolitan Asylums Board—Mr. R. M. BEACHCROFT presiding.

The CHAIRMAN, before proceeding with the ordinary business, referred in sympathic terms to the death of Mr. J. H. Brass, the representative of the Chelsea Borough Council, which took place on the 28th ult.

A vote of sympathy and condolence with Mrs. Brass and the family was passed.

The CLERK (Mr. A B. Pilling) reported that Mr. J. Dix Lewis had been elected to fill the vacancy caused by the resignation of Mr. Henry Burt, who had represented the Hornsey and Wood Green Urban District Councils. He also read a letter from Mr. H. P. Harris, one of the representatives of the London County Council, resigning his seat on the Board; and the resignation was accepted with regret. Mr. Henry Clarke, another representative of the Council, also tendered his resignation. In reply, however, to a letter addressed to him as the result of an informal meeting of the Board, requesting him to reconsider his decision, Mr. Clarke had replied that he was willing to place himself in the hands of his colleagues.

The CHAIRMAN stated that, under the circumstances, he had no alternative but to accept the resignation.

Both seats were therefore declared vacant.

The Finance Committee reported that, in consequence of the demands upon his time in other directions, Mr. D J. Morgan had resigned his office as Chairman of the Committee.

A proposal standing on the *agenda* to consider the question of appointing a Vice-Chairman of the Board was postponed until the 27th prox.

A report by the Special Arbitration Committee was next submitted, stating that they had entered into negotiations with the District Councils of Tottenham and Enfield in regard to the amount to be paid in consideration of the transfer of their water undertaking, so as to save much of the expense that would be incurred if the matter had to be settled by arbitration. Similar negotiations had been opened with the boroughs of Croydon and Richmond and the District Councils of Cheshunt and Ware, to determine, if possible, the amount to be paid in respect to the loss by the Board, and the acquisition by the Councils, of the right of supplying water within those parts of the boroughs or districts which the Councils were not supplying at the passing of the Act, and also as to the supply of water in bulk by the Board to those authorities.

The action of the Committee was approved without comment.

They further reported that on the 12th of June, the Finance Committee submitted to the Board an estimate of £30,000, which the Arbitration Committee had forwarded to them in respect of the expenditure for the period from the 22nd of May to the 30th ult. in preparing the answers to the statements of claim of the several Water Companies and District Councils and in preparing for the hearing of such claims. This period having expired, they asked the Board to

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	25,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

vote a further sum; and they had therefore sent to the Finance Committee an estimate of £14,000 to cover expenditure to be incurred up to the 31st of October; thus making the total vote to that date £44,000. They recommended that this estimate be approved.

On the motion of the CHAIRMAN, the report was received, and the recommendations contained therein were adopted.

The General Purposes Committee reported that they had had under consideration the question of the steps which should be taken in view of the pending transfer of the water undertakings to the control of the Board. They brought this important matter before the Board with a view to something being done in this direction without loss of time. It might be assumed that the management of the undertakings by the Board would be conducted by means of Committees. The exact nature of the work to be performed by such Committees, however, and the nature of the division of the work among them, were questions which would require very careful consideration; and they thought that, in order to enable the Board to arrive at a proper conclusion on the subject, it would be of the greatest assistance if they were placed in possession of particulars of the methods of organization by which the undertakings were at the present time controlled and managed by the various Boards of Directors. They, therefore, recommended that the Clerk of the Board should be instructed to address a communication to the Secretaries of the several Water Companies, asking that the Board might be favoured with particulars as to (1) the control at the present time exercised by the various Boards of Directors; (2) the power conferred upon the respective chief officers; and (3) generally as to the machinery by which the undertakings were organized and managed, and also for copies of any standing orders, rules, or regulations which might be in force for the management by the Companies of the respective undertakings; also that it should be an instruction to the General Purposes Committee, on the receipt of the replies to the communications to be sent in pursuance of the foregoing resolution, to prepare, as soon as possible for the consideration of the Board, a scheme for the appointment of such Committees as might appear desirable with a view to the management of the undertakings by the Board.

Mr. PICKERSGILL remarked that the Water Companies and the Board were, at present, practically at arms' length, and before proceeding further in this matter the Board should obtain the assistance of some of their legal advisers, though he saw no objection to any of the terms in the recommendations. In his opinion, the Board should not confine themselves to the London Water Companies, but should also seek information from the great municipal authorities throughout the country, who for many years past had successfully controlled their own water undertakings; and he thought a deputation from the Board should visit some of the great municipal water-works, and bring up a report on the subject. He moved, as an amendment, that the following words should be added to the first recommendation: "Subject to the legal advisers to the Board seeing no objection."

The CHAIRMAN stated that, the legal adviser being present, he asked him the question, and had been informed that there was no objection to the recommendations.

The report and recommendations were adopted; and after transacting other business the Board adjourned.

ADDITIONAL WATER STORAGE FOR TORQUAY.

The first turf of the new reservoir which the Torquay Corporation are about to construct at Trenchford, on Dartmoor, was cut on Thursday last by the Mayor (Mr. John Taylor). The reservoir will have a capacity of 200 million gallons; its area being 30 acres, its greatest length half a-mile, and its depth at the embankment 50 feet. The embankment to be constructed is 520 feet in length, with a height from the foundation of 80 feet, and a width at the top of 20 feet. Below the surface of the ground it will have a concrete core, and above a clay core backed with earth. The estimated cost is £22,000. The works were designed by Mr. W. Ingham, formerly Water Engineer at Torquay (now at Port Elizabeth), and their construction is to be carried out by the Corporation under the direct supervision of the present Engineer (Mr. S. C. Chapman). In presenting a silver spade to the Mayor, Alderman E. P. Bovey, the Chairman of the Water Committee, spoke of the improvements effected in recent years in the water supply of Torquay, and in particular of the advantage which had accrued from the purchase of the watershed and the removal of all the buildings upon it, so that the water was now pronounced to rank with the best upland supplies in the kingdom. As to the present extension, the Committee did not fully realize the urgency of the need of more storage until the autumn of 1901, when they were startled to find that only ten days' constant supply remained in the reservoirs. The Committee were also impressed by the fact that, in addition to the tendency towards increased consumption for cleaning and sanitary purposes, there was continued growth in the number of consumers; and it was estimated that by the time the reservoir was completed, the annual requirements would have increased by 60 or 70 million gallons. They would then have a total storage capacity for a constant supply to 75,000 persons. The Mayor, in the course of his speech, referred to the purity of the water, and pointed out that Professor Frankland, in his recent report, had said nothing about filtration, though he was "a filtration man." For his own part, the Mayor added, he hoped they would not set up filter-beds, for he was convinced that water of such a high standard of purity as theirs could not be improved by any process of filtration. The only things that could be found in the water were the particles washed down by the streams, and these could be easily removed by straining through a fine mesh.

The Directors of the Imperial Continental Gas Association recommend a dividend of 5 per cent. for the six months ending the 30th of June, free of tax.

No. 26—New Model.
"SYPHON" RADIATOR.

PURE HEAT.

WITHOUT SMOKE OR SMELL.

CLARK'S PATENT

"SYPHON" RADIATORS.

NO FLUE - - -
- IS REQUIRED.

VERY POWERFUL STOVES
OF ARTISTIC DESIGN.

WRITE FOR CATALOGUE OF NEW DESIGNS FOR SEASON 1903-4.

No. 24—New Mode
"SYPHON" RADIATOR.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Interest in the appointment of a Gas Engineer for Glasgow has this week been transferred from Glasgow to Edinburgh. A report of the meeting of the Edinburgh and Leith Gas Commission is given in another column of the "JOURNAL" to-day. By what took place then, an end is put, once for all, to the rumours which have been prevalent regarding the possibility of Mr. W. R. Herring going to Glasgow. I never could bring myself to believe that such a step was likely. The probabilities were all against it. One ground alone, if there were no other, made it almost a certainty that Mr. Herring would not have succeeded if he had sought the post. He would have had either to carry out the schemes of the late Mr. Foulis, or to bring the Corporation round to his way of thinking. It is quite likely he would have been successful in the latter. But the Corporation could not but have been aware beforehand that such an attempt would be likely to be made; and there is no room for doubt that they would have been extremely unwilling to have the cherished policy of their late Gas Engineer set aside so soon after his removal. I should say the probability is greater that they would have been unwilling to have any change of plans, than that Mr. Herring would have been content to be a follower of Mr. Foulis. So Mr. Herring took the right course when he resolved not to become a candidate for the Glasgow post. For it is a fact that he did not. This fact is a direct contradiction to the statement by Bailie M'Kelvie that he had practically the appointment in his hands. Mr. Herring did not apply; and therefore it was impossible that he could have had any confidence that he would get the post. I emphasize this point, because the statement of Bailie M'Kelvie is resented in Glasgow, as being a reflection upon their method of doing business. His statements were repudiated in Edinburgh; and I suppose the repudiation must be held to cover this part of the incident as well as his view that there had been a scandal in the bringing forward of the proposal to increase the Engineer's salary.

But while this is the case, it is equally true that the proposed increase was brought forward under the influence of panic. The Commissioners did fear that Mr. Herring might leave them at this time, because it is otherwise impossible to explain why they should have made it a condition of his getting an increase that he should give an undertaking to remain as Gas Engineer in Edinburgh for at least five years. The undertaking has been given, so that Mr. Herring's services are secured to the Commissioners for the next five years, by which time there will be a further extension at Granton, and the Edinburgh works will probably be closed. It will be observed that the Commissioners make the increase of salary in respect of work done, and hold that it forecloses all questions between them as to an honorarium for past services. It is evident that it was their intention to vote something handsome to Mr. Herring, who has done so much for them; and the opportunity arose when, as they thought, he might leave them. The Commissioners have gained two objects by the one act—they have got rid of the question of honorarium, and they have secured the services of their valued Engineer during a time when they anticipate that they will have pressing need for them. On Mr. Herring's part, circumstances have favoured his getting a substantial increase to his remuneration as well as a settlement of his affairs which might have given rise to some unpleasantness if protracted negotiations had been entered into. It is better for both parties that the thing should have been settled speedily. It was inevitable that any proposals for further remuneration should be opposed; so that the sooner the business was over the better. It is wonderful, in fact, that there was so little opposition within the Commission; but it was not a very full meeting, and some, notably, were absent who might have been expected to have been on the side of resistance. It is a wonder, too, that there has been so little objection from the outside. There have been one or two letters in the newspapers protesting against the payment of so high a salary, but nothing like what one has seen over similar matters. There will probably be more letters; and as the municipal elections are imminent, no doubt there may be some comment upon the subject. But as the incident is closed and ratified, any such procedure can only possess an academic interest. The merits of the proposal were not gone into by the Commissioners further than that, having a good servant, they should pay him a handsome salary. That exactly hits off the situation; and accepting it in that light, there will be no disposition, among gas managers, to grudge Mr. Herring this step on the part of the Commissioners, which places him in the very first rank of his profession. The disposition rather will be to congratulate him upon his lines having fallen in such pleasant places. There is a public view of the matter which should not be overlooked. This action of the Edinburgh and Leith Gas Commissioners raises the standard of remuneration for gas managers—at least, this ought to be its effect—and in this respect it should be looked at kindly.

It is not to be lost sight of, in relation to the affairs of the Edinburgh and Leith Gas Commissioners, that the whole of the gas supply to the district is at present being sent out from the new works at Granton; the Edinburgh words being meantime closed. In this connection it is interesting to note that the wages in the carbonizing department at Granton amount to 1·96d. per 1000 cubic feet of gas made, in comparison with 5·61d. in the Edinburgh works, in August; and that the wages for purification are, respectively, 0·93d. and 1·16d. per 1000 cubic feet of gas made.

The valuation of the undertaking of the Commissioners for the current year has been made up, and amounts to: In Edinburgh, £75,460, compared with £55,922 last year; in Leith, £6417, compared with £11,895; and in the County of Mid Lothian, £2166, compared with £2558. The total is £84,043—an increase of £13,668.

The estimates, prepared by Mr. John S. Gibb, the Treasurer, upon which the Edinburgh and Leith Gas Commissioners have proceeded in fixing the price of gas at 2s. 9d. per 1000 cubic feet, provide for a

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consumption to the amount of 1,866,168,000 cubic feet, which is an increase of 63,104,000 cubic feet (equal to 3½ per cent.) upon the quantity of gas sold last year. The revenue from the sale of gas is estimated at £264,671, as compared with a revenue last year of £277,249; the reduction in the price accounting for the decrease in the receipts. For coke, it is estimated that £19,620 will be received—an increase of £5436 upon the actual receipts last year; for gas tar, £15,900—a decrease of £4688; for oil gas tar (a new product in the works), £360; for sulphate of ammonia, less working expenses, £16,643—an increase of £175. On the expenditure side, it is estimated that 170,163 tons of coal will be carbonized—an increase of 5187 tons; and that the cost of coal will be £105,101—a decrease of £3480. Gas oil (of which 2000 tons are to be used, against 3835 tons last year) is estimated to cost £6000—a decrease of £1619. Purifying materials are estimated at £8000—a decrease of £2890; salaries and wages, £35,000—a decrease of £8664; and repairs of works and plant, £12,000—a decrease of £459. The total cost of the manufacture of gas is estimated at £166,101—a decrease of £17,113. The distribution of gas is estimated to cost £28,500—a decrease of £1151; management, £10,400—an increase of £617; and feu duties, rates, and taxes, £14,500—an increase of £2009. The total revenue is estimated at £317,755; and the total expenditure at £311,511—leaving an anticipated surplus of £6244. These figures possess an unusual interest in that they bring out the effect upon the undertaking of the opening of the Granton works. But, of course, as the Edinburgh works will be still in active employment, the full effect will not yet be felt.

A meeting of the Glasgow Gas Committee was held yesterday to consider as to the disposal of the gas accounts for the past year and the price to be charged for gas, which matters were sent back to them by the Town Council at their meeting on the 17th ult. The Committee unanimously resolved (1) that the sum of £13,895, stated in the accounts as the loss on the electricity account for the year ending May 31, instead of being applied in paying off the deficit on the electricity accounts, be placed to a suspense account; and (2) that the sum of £19,124, instead of being credited to the premium account connected with the gas annuities converted into Corporation stock, as proposed, be carried forward to next year's accounts of the Gas Department. On the question of the price of gas, Bailie Finlay moved that the charge during the current year for all purposes, within the whole area of supply, except the district of Milngavie, be at a uniform rate of 2s. 1d. per 1000 cubic feet, and within the district of Milngavie at the rate of 3s. 1d. per 1000 cubic feet. Bailie D. M. Stevenson moved that the price of gas for all purposes, within the whole area of supply, except the district of Milngavie, be at the rate of 2s. per 1000 cubic feet for the period of the year embraced in the first six months' survey, and at the rate of 2s. 1½d. per 1000 cubic feet for the remainder of the year. Mr. Blair moved that the price for lighting purposes within the whole area of supply, except the district of Milngavie, be at the rate of 2s. 1d. per 1000 cubic feet; that the price for motive power purposes be at the rate of 2s. per 1000 cubic feet, being the same rate as charged last year; that the price for lighting purposes within the district of Milngavie be at the rate of 3s. 1d. per 1000 cubic feet; and that the price for motive power purposes within the same district be at the rate of 3s. per 1000 cubic feet, being the same rate as charged last year. The motion by Mr. Blair was carried by a majority of nine to seven. The subject is to be discussed in the Town Council at their meeting next week.

At the Dundee Town Council on Thursday, Mr. Mitchell wished to know why an individual who desired to get a larger gas-stove than one he had had for five years, could not get one at the Gas Office. Mr. M'Kinnon went further, and preferred the general charge that parties who had gone to the Gas Office in regard to gas-stoves "had received nothing but impertinence." Treasurer Ritchie took strong exception to the bringing forward of such a sweeping charge; he was safe in saying the charges were not true. There might be an individual case; but he knew the desire in the office was to treat the public in the most courteous and gentlemanly manner. If any special charges were preferred, the guilty person would be brought to book. The subject was referred to the Gas Committee. There is something of the molehill and the mountain here. There can be little doubt that the "impertinence" averred was nothing more than the pressure which must be exercised everywhere to prevent the very thing which the individual referred to by Mr. Mitchell wanted to do—which was, after he had had a gas-stove for five years, to throw it back upon the Corporation, and get a new one at the public expense. Mr. Mitchell could have got this information privately, if that would have suited him.

I mentioned a fortnight ago that Mr. M'Gregor Mitchell, a member of the Perth Town Council, had prepared a report upon the public lighting of the city by means of incandescent gas. He moved the adoption of his report in the Town Council on Thursday. While, he contended, electricity had been an unqualified success for private lighting, it was now coming to be recognized that it was a failure for public lighting. The recommendations contained in his report, if adopted, would result in a saving of £800 a year, in addition to giving much more effective lighting than was obtained from the present system of combined electricity and gas lighting. The Council, after a discussion, referred the subject to the Sub-Committee on Lighting. It will thus be heard of again.

The Gas Committee of the Dumfries Town Council, at a meeting of the Corporation on Monday, recommended that £1000 be added to the reserve fund, and that the price of gas for the current year be fixed at 3s. per 1000 cubic feet to ordinary consumers—a reduction of 6d.; to consumers per prepayment meters, at 3s. 8d.—also a reduction of 6d. per 1000 cubic feet; and to users of gas for motive power, at 2s 6d. per 1000 cubic feet—a reduction of 1s. Mr. Currie, in moving approval of these recommendations, said it was always very pleasant to consumers of gas when the price was reduced; but on this occasion it would be pleasant not only to consumers of gas for lighting but also to manufacturers. The Committee anticipated that the reduction made to these would lead to a larger consumption of gas. While making all these

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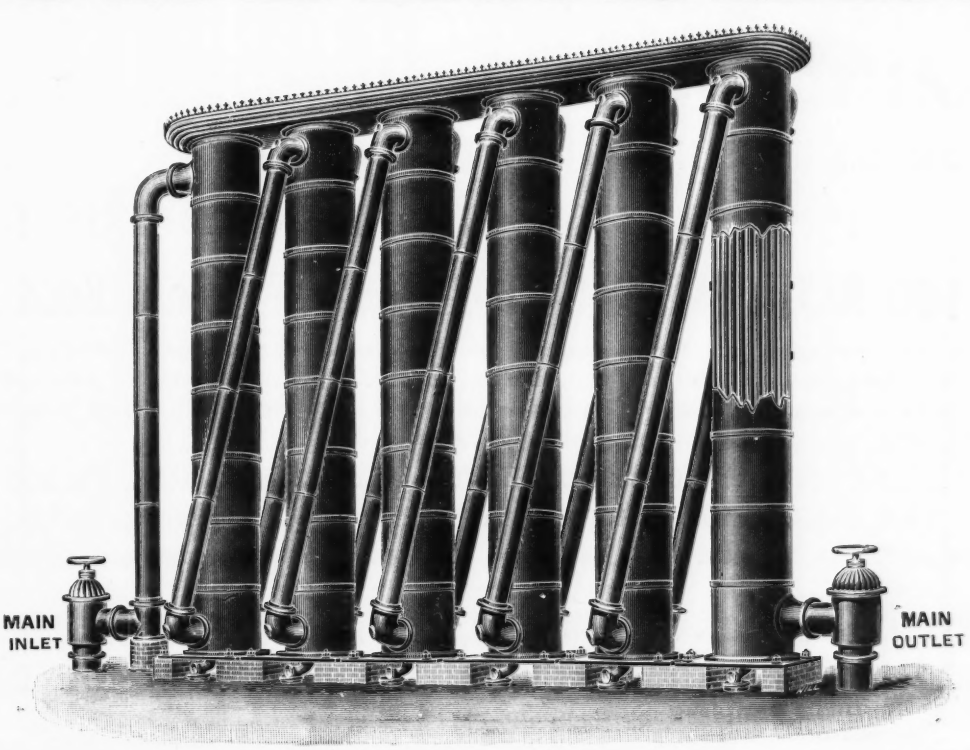

ATMOSPHERIC.

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reductions, they would be able to carry a balance of £1093 to the current year's account. It was very satisfactory that they should be in this position. They had been twitted during the year that the gas undertaking was a rotten concern, and needed to be inquired into. Now they found that the past had been the most prosperous year in the gas-works since the Corporation took them over. Mr. Brunton, while congratulating the Convener and the Committee on the success of the past year's working, disagreed with their proposal to supply gas for power at half-a-crown. It was bad business, either in a public or a private concern, to sell a thing at less than it cost them. The least they could produce gas at was 2s. 9d. or 2s. 10d. per 1000 cubic feet; and to sell it at less than this figure was not fair. Those who were burning gas would be subsidizing those who used it for power. He was prepared to do the utmost he could to encourage the consumption of gas for power purposes; but he would not sell it at a loss. He moved that the price of gas for power be 2s. 9d. per 1000 cubic feet. Mr. Thomson said that if they reduced the price to only 2s. 9d. they would be still losing £17 a year. But there were certain things which could be done to encourage trade in the town; and the Committee thought that the loss here was so small, and the benefit to the community was likely to be so great, that they recommended the reduction. Bailie Scott said there was no doubt that in a very short time they would have to face competition with electricity, whether by the Corporation or a company. This was one of his chief reasons for supporting the proposal to encourage people to put in gas-engines instead of engines driven by oil or by electricity. They could make even a little profit by supplying gas at the proposed price for power; but many people had to sell some things at less than cost price in order to sell other things. Provost Glover supported the amendment. He did not think it became the Council to anticipate competition to the extent of selling gas for less than it cost them, with a view to keeping anybody out or entering upon such competition. He thought it was a standing principle in any business which was intended to succeed that every item should support itself. He was strongly opposed to the selling of gas at less than the cost of production for any purpose—for the simple reason that it was likely to rebound against themselves. Mr. Currie said that in Committee he was in favour of 2s. 9d. for gas for power purposes, and he would agree to his motion being altered to that figure. This was then agreed to.

On account of the operation of the modern audit system, information regarding municipal undertakings comes out in driblets. This is the reason why I return—for, I think, the third time—to the gas accounts of the Corporation of Kilmarnock. These have now been printed and issued in the form in which they will go into the archives of the Corporation. The accounts are framed in accordance with the provisions of the Town Council's Act of 1900; and, as I have said before, they deal with only eleven months. In that time, 14,800 tons of coal were carbonized, yielding 145,551,300 cubic feet of gas. This is equal to 9800 cubic feet of gas per ton, and is in comparison with 9410 cubic feet in the year preceding; while the average price of coal per ton was 12s., compared with 13s. 6½d. The unaccounted-for gas increased from 8 to 9¼ per cent. The sale of gas realized £19,253, and of residuals £4061. The gross profit on the working was £4217, which is equal to over 10 per cent.

Some public men are not sturdy exponents of the views they hold, but, on the contrary, are fair examples of the one who was caricatured as saying that if his views did not suit they could be altered. Such a one is Mr. Scott, of Dundee. Recently, at a meeting of a Ward Committee or other controlling force, he made use of an expression which the Gas Workers and General Labourers' Union interpreted as being inimical to their cause. He asked if it was in accordance with business principles to employ a man to shovel coal at 6d. per hour, when another man could be got to perform the same work for 4d. The subject was brought before the Union, who sent a deputation to see Mr. Scott. The report of the deputation was given on Monday night, at a meeting of the Union, and was to the effect that they were most courteously received by Mr. Scott, and that "after discussing the whole question, the councillor gave them the assurance that in the future he would strenuously adhere to the standing order of the Town Council—namely, that contractors pay the standard rate of wages, and, further, that all Corporation employees receive the standard minimum wage." Mr. Scott's account of what he said has not been given; but he has not contradicted this statement on its publication in Dundee, and one may thus accept it. I wonder, if another deputation were to call upon Mr. Scott, whether he would give them an assurance that he would strenuously support their views in the Council; and whether it has ever dawned upon men of his type that, in giving such pledges, they are constituting themselves representatives of sections of the community which it is their duty to represent as a whole. A public man may act according to preconceived notions, when the time arrives for action, which is bad enough, because it is not deciding a particular question upon its merits; but it is a much worse position to be in to give pledges beforehand as to his course of action upon certain events arising.

The twenty-fifth annual meeting of the Banchory Gaslight Company, Limited, was held on Tuesday. It was reported that the year had been very profitable. Coal had cost less, and more gas had been sold. Further—thanks to the exertions of the Manager, Mr. R. Forrest—unaccounted-for gas had been reduced from 12·19 to 5·9 per cent. After writing £40 off the cost of plant, and transferring £46 to reserve and depreciation account, the balance of profit amounted to £240. The usual dividend of 1s. per share was paid; and the balance was carried forward pending a revaluation of the Company's affairs before the next balance. The price of gas was reduced from 7s. 6d. to 7s. 1d. per 1000 cubic feet. In recognition of his services, Mr. Forrest was granted an increase of salary.

According to a telegram sent through Reuter's Agency at a meeting of the shareholders of the Dominion Oil Company, held at Toronto on the 2nd inst., it was decided to wind up the Company. The Attorney-General has been asked to investigate the subject of the promotion of the undertaking.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 3.

Sulphate of Ammonia.

The activity towards the end of last month has not been sustained through the present week. September requirements being covered, and there being less demand, values have in fact barely been maintained; the closing quotations being £12 5s. per ton f.o.b. Hull, £12 7s. 6d. per ton f.o.b. Liverpool, and £12 8s. 9d. per ton f.o.b. Leith. Interest in the forward position, however, continues, and after further sales at £12 10s. per ton, ordinary terms, f.o.b. Leith, for January-June delivery, makers now require £12 12s. 6d. per ton. Sales for March-August are also reported at up to £12 10s. per ton f.o.b. Leith. London, Beckton terms, for delivery up to the end of the year, is quoted £12 12s. 6d. per ton; but so far buyers do not seem inclined to pay the price.

Nitrate of Soda.

The position of this article is becoming stronger, and holders are very firm both for prompt and forward delivery. Spot prices are 9s. 10½d. per cwt. for ordinary, and 10s. 3d. for refined quality.

LONDON, *Oct.* 2.

Tar Products.

There is nothing special to report. The demand for benzol continues good, especially for 90 per cent., which is being freely inquired after for prompt delivery. Fifty-ninety per cent. is also slightly firmer, an offer of 7½d., October-December, having been declined—makers now holding for 8d. over this period. Toluol and solvent remain in about the same position; prices being purely nominal. The demand for heavy naphtha continues very good; several Continental inquiries having lately been sent into this market. In crude carbolic, further business has been done at 1s. 6d. for October-December, while a sale is reported at 1s. 6⅝d. for January-June next. The value of creosote is well maintained; and for early delivery the demand continues good, especially for liquid oil, for which there is a large inquiry. The market for pitch is practically unchanged. So far as the Continent is concerned, there is nothing doing. The offers made by speculative dealers, at very low prices, have completely stopped any chance of business over next year, at any rate for the time being. Under existing circumstances, most of the large consumers will defer covering their requirements until absolutely necessary; the numerous offers made leading them to believe in a further fall. Meanwhile, the demand from South Wales continues very good; and most of the Continental consumers are pressing for deliveries, which points to the fact that stocks abroad are not large. As regards tar, the values remain about the same; but there is a decidedly easier tone, distillers evidently not caring for the responsibility of highly inflated prices in face of the present state of the pitch market.

The average values during the week were: Tar, 23s. 6d. to 30s. 6d. Pitch, London, 52s. to 52s. 6d.; east coast, 51s. to 51s. 6d.; west coast, 50s. to 50s. 3d. Benzol, 90 per cent., 9¼d. to 9⅜d.; 50-90 per cent., 7½d. Toluol, 6½d. Crude naphtha, 3d.; solvent naphtha, 7½d. to 8d.; heavy naphtha, 9d. to 10d. Creosote, London, 1 7/16d. to 1½d.; North, 1¼d. Heavy oils, 2⅛d. Carbolic acid, 60 per cent., 1s. 6d. Refined naphthalene, £5 to £8. Salts, 24s. to 26s. 6d. Anthracene, "A" quality, 1⅜d. to 1⅞d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market is very firm; and there is a strong demand for forward delivery. The Gaslight and Coke Company are still quoting £12 12s. 6d. for prompt, and are asking £12 15s. for forward; but at present there is no business doing at these prices. In Hull, further business has been done at £12 5s. for October shipment; but makers as a rule ask £12 6s. 3d. to £12 7s. 6d. for November-March. In Liverpool, business has been done at £12 7s. 6d. and £12 8s. 9d. for prompt delivery. In Leith, there is a considerable demand, especially for prompt delivery. It is stated that £12 10s. has been paid for January-June; and in one instance this price is reported to have been declined by a large manufacturer. The market closes very firm indeed, with a large demand for forward delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Business continues generally slow throughout all branches of the coal trade in this district, and pits are still kept on short time. The better qualities of round coal as yet meet with only a very moderate inquiry for house-fire purposes; and notwithstanding the restricted output, supplies are ample to meet all requirements, with prices not more than maintained at the rates ruling last month. At the pit, best Wigan Arley coals are quoted from 13s. 6d. up to 14s. 6d. per ton, seconds Arley and Pemberton four-feet from 11s. and 11s. 6d. to 12s. 6d., and common house-fire coals from 9s. 6d. to 10s. 6d. The lower descriptions of round coal remain in but indifferent request for iron-making, steam, and general manufacturing purposes; and of these there are plentiful supplies on the market, which in some cases necessitate special sales at under current rates, low quotations being made for shipment. Prices all through are weak, if anything, at late rates. On inland sales, 7s. 9d. to 8s. 3d. per ton is taken for the commoner sorts of steam and forge coals, with the better qualities about 8s. 6d. to 8s. 9d. For shipment, there has been no difficulty in buying steam coals delivered at the ports on the Mersey at about 9s. per ton, representing about 7s. 3d. to 7s. 6d. at the pit, with better qualities quoted at 9s. 6d. to 9s. 9d. Of slack, supplies continue in excess of requirements, and a want of firmness characterizes prices for the commoner sorts; but better descriptions are fairly steady. Special sales are, however, made to large consumers at rates considerably below the current list basis. Prospects of improvement in the cotton trade are giving a more hopeful tone to the immediate future, as with a probability of a resumption of full time at

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the mills a good deal of the present surplus would be quickly cleared away. At the pit, prices average about 4s. to 4s. 6d. for common slack, 5s. to 5s. 6d. for medium, and 6s. 3d. to 6s. 9d. for the best qualities. Coke is strong, with makers finding a ready market.

Northern Coal Trade.

The demand for some classes of coal is a little easier; the shipments to some of the Northern ports showing a falling off as the end of the season is now near. There is a good demand for best qualities of steam coals; and the price is steady at from 10s. 4½d. to 10s. 6d. per ton f.o.b. Second-class steams are not quite so strong; and the price is from 9s. to 9s. 3d. per ton f.o.b. Steam smalls are easier at from 5s. 3d. to 5s. 6d. per ton f.o.b. The output of the steam coal collieries is fairly well taken up for the first half of this month. In the manufacturing coal trade, prices are easy; the consumption being limited at some of the large factories. Gas coals find now a better demand. There is still an adequate supply; and the prices are not materially altered—ranging, according to quality, from 8s. 6d. to 9s. per ton f.o.b. There have been no contracts of moment for gas coals noted in the last few days. Coke is moderately steady; the supply being now generally abundant. At the inland towns, the prices of gas coke are weaker; while at sea ports about 14s. 6d. per ton is still quoted.

Scotch Coal Trade.

The market is fairly active; there being a sustained demand equal to the output, which is quite a full one. There is a very large shipping business, though there were lessened sailings, which was accounted for by foggy weather. The prices quoted per ton f.o.b. Glasgow are: Main, 7s. 9d. to 8s.; ell, 8s. 6d. to 9s. 9d.; and splint, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 224,117 tons—a decrease upon the previous week of 40,33¼ tons, and upon the corresponding week of last year of 20,577 tons. For the year to date, the total shipments have been 8,168,377 tons—an increase upon the same period of last year of 275,043 tons.

Hayling Gas-Works Sold by Auction.—The Hayling Gas-Works were recently offered for sale by public auction at the Victoria Hall, South Hayling. After considerable bidding, the lot (which included the works, yard, and cottage, together with the mains and other plant) was knocked down at £1800.

The Folly of the Felixstowe District Councillors.—Attention has been called to the fact that, in the article which appeared in the last issue of the "JOURNAL," under the above heading, a statement by a witness at the Local Government Board inquiry was misinterpreted. It was said that the average price charged by the Electric Lighting Company in the town was 7d. per unit. We dealt with this as being the maximum price, whereas the price for lighting purposes has always been 8d. per unit. Thus, if the singular project which has been placed before the Local Government Board is sanctioned by the granting of the loan sought, there will be no increase in the price per unit in the summer months, but there will be a reduction to 6½d. per unit in the winter. It is believed that the opposition at the inquiry created a good impression among the ratepayers; and there is now some talk in the town of sending a petition to the Local Government Board against the granting of the loan.

Reductions in Price.—The Directors of the Redcar, Coatham, Marske and Saltburn Gas Company announce that the price of gas will be reduced 2d. per 1000 cubic feet as from the 1st of July. The Renfrew Town Council have resolved to reduce the price of gas from 3s. 4d. to 2s. 11d. per 1000 cubic feet. As from last Thursday the price of gas in Northampton will be reduced 1d. per 1000 cubic feet; the discount allowed for prompt payment remaining as before. This reduction is equivalent to a gift of £2500 to the consumers by the Gas Company. A reduction of 1d. per 1000 cubic feet is to be made to the consumers of gas through ordinary meters in Leamington. The price of gas in Dumfries has been fixed at 3s. per 1000 feet to ordinary consumers, and 2s. 9d. if used for power purposes; being a reduction of 6d. and 9d. respectively. The Alliance and Dublin Consumers' Gas Company intend to make a reduction of 2d. per 1000 cubic feet in the price of gas as from the end of the year. A reduction of 2d. per 1000 cubic feet has been made by the Cirencester Gas Company, to date from the 29th ult. The Gas Committee of the Newry Urban District Council have reduced the price of gas 5d. per 1000 cubic feet to ordinary consumers, and have decided to allow an extra 5 per cent. reduction to users of gas engines. The Corporation of Rothesay on Wednesday reduced the price of gas from 3s. 1½d. to 2s. 11d. per 1000 cubic feet.

The Quality of Rivington Water.—In the course of the paper on "The Potable Waters of South-West Lancashire" read by Dr. Campbell Brown at the meeting of the British Association (*ante*, p. 752), he stated that the Rivington water supplied to Liverpool had never been subjected to complete analysis until a full one was made by himself about a month previously. The statement possibly caused alarm, for the Water Committee instructed the Town Clerk to ask for an explanation. This was given, and it was submitted to the Committee at their meeting on Tuesday. Dr. Brown wrote: "In a sanitary analysis, only those details which have a bearing on the wholesomeness of the water are determined quantitatively; while all the various ingredients which have no such significance, and which do not vary from time to time, are not estimated. A complete analysis determines precisely every ingredient, however slight or insignificant, dissolved in the water. Such a complete analysis ought to be made, once for all, when a new source of water supply is chosen, or when serious changes have been made; but it would be a waste of money to repeat all the details periodically. . . . . No such analysis has been made of the Rivington water, probably because neither the Water Committee nor the chemists of fifty years ago understood the usefulness of the figures for reference. I have now supplied the defect, and the figures are available when wanted. They have already been useful; and I may add for the information of the Water Committee that they disclose the fundamental high character of the Rivington supply, provided it can be freed from natural impurities, which do not essentially belong to this natural water."

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Free Cookers in Birmingham.—Considerable success promises to attend the decision of the Birmingham Corporation Gas Department to supply cookers free of charge with prepayment meters. The new arrangement comes into force this month; but by the end of September, close upon 1000 applications had already been received.

Issue of Further Capital by the Portsmouth Water Company.—On Wednesday last, Messrs. Love and Cooper sold 2000 new ordinary £5 shares in the Portsmouth Water Company; being the fifth issue of new capital under the Borough of Portsmouth Water Order, 1902; the interest thereon being limited to 5 per cent. There was a brisk demand for the shares, the bulk of which fetched £6 5s. and £6 7s. 6d. each; the total amount realized being £12,599 7s. 6d. In June a similar sale produced £12,825; one in April, £13,002; one in December last, £12,683; and one in the preceding October (the first), £12,746

Improved Business at Newry.—At the last meeting of the Newry Urban District Council, gratification was expressed at the announcement by the Gas Committee of the reduction in price to ordinary consumers and power users notified in another column. The improved financial position of the gas undertaking since the appointment, about a year ago, of Mr. Brooke Gibson as Manager has allowed of this concession being made. He has shown a great deal of zeal in managing the concern, under the Gas Committee; and they have given him a free hand. In the course of the twelve months, he used 4021 tons of coal, and produced 40,417,000 cubic feet of gas; being an increase of 6,732,000 cubic feet.

Luton Gas Company.—At the 91st ordinary meeting of this Company on Friday, the Chairman (Mr. J. Blundell) said he was pleased to report continued prosperity. The sale of gas during the past six months had exceeded that of the corresponding period of last year by 5 million cubic feet; and notwithstanding the reduction made in price, the gas-rental had not decreased. The Directors had, in consequence of the lower price of coal, resolved to reduce the price of gas to 2s. 4d. per 1000 cubic feet after the Michaelmas reading of meters. The usual dividends were declared, and the Chairman, Directors, and Manager (Mr. W. R. Phillips) were cordially thanked for their attention to the interests of the Company.

Gas Profits at St. Helens.—In his annual statement of accounts of the St. Helens Corporation, the Borough Treasurer (Mr. John Brown) reports that the profits on the gas-works for the past year amounted to £9050, notwithstanding a decrease in the price of gas of 3d. per 1000 cubic feet. This sum has been allocated in the following manner: To the borough fund £3500, capital account £1949, suspense account £1468, and reserve fund £2133. The total profits carried to the borough fund since the works were purchased from the Gas Company in 1878 have reached the sum of £56,030; while the price of gas has been reduced from 4s. net to 2s. 3d. (less a discount) per 1000 feet. The capital expenditure on the works stands at £297,882.

Dorking Gas Company.—The 65th half-yearly general meeting of this Company was held on Tuesday—Mr. W. T. Butler in the chair. The report of the Directors for the six months ending June 30 showed that, after providing for the interest on the debenture stock, there was a balance of £2238 available for distribution; and the Directors recommended the payment of maximum dividends on all classes of shares. This would absorb £1487, and leave £751 to be carried forward. The report also recorded that the sale of gas to private consumers had increased by 4·51 per cent. The manufacturing operations (under the supervision of Mr. S. Carpenter) had been satisfactory. The contract for coal had been made at a slightly lower price; and the residuals were steady at last year's figures. The report was adopted, and the dividends were declared. A vote of thanks to the Directors and officials for their efficient services during the half year was unanimously accorded.

New Pumping-Station for St. Helens.—Last Thursday, the ceremony of opening the Melling pumping station of the St. Helens Corporation was performed by the Mayor (Mr. F. R. Dixon-Nuttall), who is Chairman of the Water Committee. The works include a very fine horizontal compound engine, designed by Mr. J. J. Lackland, the Water Engineer, and constructed by Messrs. Robinson, Cook, and Co., of St. Helens. It is 96 feet in length, and its fly-wheel, which is 27 feet in diameter, weighs no less than 25 tons. At a luncheon in the Town Hall, the Mayor gave a short history of the work. He said that during the building much difficulty and consequent delay were experienced, because of the treacherous nature of the material to be removed for the foundations, which were on rock at about 28 feet from the surface of the ground. After several unsatisfactory trials, pumping was finally started into the main on the 7th of August. The greatest anxiety was felt by the Engineer and himself as to whether they would get the expected quantity of water when they reached the bottom; but he was glad to say they had an ample supply. They had pumped for 24 hours, and had only reduced the level by 60 feet. He congratulated the town of St. Helens on possessing one of the finest pumping-stations in England.

Profit v. Depreciation Fund in Electric Light Undertakings.—A statement was submitted to the Exeter City Council last Thursday showing that the net profit of the electric light undertaking for the fifteen months ended the 31st of March was £2360, and that the accumulated profits and reserve fund amounted to nearly £6000. Mr. E. C. Parry, the Chairman of the Committee, congratulated them on this satisfactory state of affairs, which he thought augured well for the future of electric lighting in the city. Mr. J. Ross pointed out that not a single farthing was allowed for depreciation in the accounts. It was a most improper thing, and very misleading; and the sooner they had a Government Auditor for such matters the better. In reply to a question, the Town Clerk stated that interest was paid on the £37,438 raised for the purposes of the undertaking, and sinking fund was paid on £18,420. The difference between the two amounts was in respect of extensions and mains, the cost of which was included in the sum last sanctioned by the Local Government Board, and for the repayment of which a period of 25 years was allowed. There was no legal obligation to pay sinking fund on this balance until the loan was raised. Mr. Perry contended that sinking fund was unnecessary, and said that the whole of the electric light plant was in a satisfactory condition.

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R. & A. MAIN, LTD.,

London, Falkirk, and Glasgow.

Windsor Royal Gaslight Company.—Though the Windsor Gas Company sold nearly 2 million cubic feet more gas in the past six months than in the corresponding period of the previous year, coals cost £570 less, purifying £48 less, wages £214 less, and repairs and maintenance £1614 less. On the other hand, there was an increased revenue from residuals of £136. The result is a profit balance of £3131, out of which are to be paid the usual dividends of 5 per cent. on the preference, 7 per cent. on the new, and 10 per cent. on the original shares. At the meeting of the Company, the Chairman (Mr. J. L. Hollis) said the half year under review, if not actually the very best, was one of the best they had ever had.

Vote Granted in Respect of Water-Mains.—"Revising Barristers have had some strange claims put before them in the Revision Courts," says the "Pall Mall Gazette;" "but it is doubtful if many have had the experience of Mr. Vincent Thompson at Cleckheaton. The Town Clerk of Wakefield claimed a vote in respect of his Council's water mains, which passed through Cleckheaton. Strong objection was made to the claim; but it was allowed, after consultation and undeniable proof that, according to section 10 of Vict. 30 & 31, cap. 106, where a corporation is rated, any officer of such Corporation, whose name is sent in writing to the Overseers to be entered on the rate-book, shall be entitled to vote in respect to the property assessed, as if it were assessed in his own name."

The address of Metropolitan Gas-Meters, Limited, is now Hyson Green Works, Nottingham.

The import of English coal at Hamburg during last month reached 302,050 tons, against 276,083 tons in the corresponding month of 1902.

Messrs. Joseph Taylor and Co., of Bolton, have in hand one of their latest builds of solid-plate lead saturators for the Dunfermline Corporation Gas Department.

The Stane and Dykehead Gas Company was registered in Edinburgh last week, with its office in Wishaw. The capital is £3000, in £5 shares. The public are not invited to subscribe.

The Directors of the Buenos Ayres (New) Gas Company, Limited, have declared an interim dividend at the rate of 6 per cent. per annum (6s. per share), tax free, for the half year ended June 30.

The Buhlmann Incandescent Syndicate, Limited, has been registered in Guernsey with a capital of £20,000, in £1 shares, to acquire and turn to account patent rights for the manufacture of incandescent mantles, &c.

The Wholesale Fittings Company, of Commercial Road, E., have issued a new and handy catalogue for the present season. It contains illustrations and prices of incandescent fittings, glassware, burners, mantles, and novelties of many kinds.

Messrs. S. Clark and Co., of Highbury and Islington, have just issued a new catalogue illustrating the different forms of their patent hygienic "Syphon" stoves. There is an introduction "On the Selection of a Heating Stove." Messrs. Clark's manufactures are not confined to gas-stoves; a section of the catalogue being devoted to their "Syphon" oil-stoves.

We learn that the New Export Incandescent Lighting Company, Limited, are introducing a new anti-vibrator with their patent burner. It is made in two portions; the upper one (formed somewhat in the shape of a dumb-bell) sliding into a cup beneath. This upper part, on which is placed the mantle-rod, is balanced on a spring, either conical or helical, which prevents any upward jar from reaching the mantle from beneath; while vertical motion is arrested by a suitable device. Vibration, either vertical or lateral, is absorbed by tiny springs, which only have to support the mantle and the upper part of the burner. The whole arrangement is practically invisible to the eye, and does not cast any shadow.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN AND CLERK. Cambridge Water Company. Oct. 13.
GENERAL FOREMAN (Gas-Works). Holyhead, &c., Gas and Water Company.
GAS-FITTER, MAIN, AND SERVICE LAYER. Brecon Gas Company.
GAS-FITTERS. Birmingham Gas Department.
GAS-FITTERS. Ilford Gas Company.
HANDY MAN. No. 4101.
INSPECTOR OF METERS AND STOVES, &c. Peterborough Gas-Works.
METER INSPECTOR AND COLLECTOR. Bexhill Gas Company.

Situations Wanted.

SECRETARY AND MANAGER SMALL WORKS. No. 4096.
SHOW-ROOMS MANAGER, &c. R. B., Peckham Rye.
WORKING MANAGER OR ASSISTANT. Poole, Madeley

Agent Wanted by French Company. No. 4094.

Gas Manufacture Correspondence Classes. No. 4103.

Plant for Sale.

COMPLETE GAS-WORKS PLANT. Sir Titus Salt, Bart., and Sons, Saltaire.

Plant, &c., Wanted.

STREET LANTERNS. No. 4074.

Gas-Works Wanted to Purchase. Bates, Wokingham.

Sales of Stocks and Shares.

BARKING GAS COMPANY. Oct. 20.
BRISTOL WATER COMPANY. Oct. 8.
CROYDON GAS COMPANY. Oct. 27.
GRAYS GAS COMPANY. Oct. 27.
GREAT YARMOUTH WATER-WORKS COMPANY. Oct 20.
HARROW AND STANMORE GAS COMPANY. Oct. 20.
MAIDSTONE GAS COMPANY. Oct. 15.
ROMFORD GAS COMPANY. Oct. 20.
SOUTHEND GAS COMPANY. Oct. 20.
SOUTH ESSEX WATER COMPANY. Oct 27.

TENDERS FOR

Buildings, &c.

THAMES VALLEY AND GORING WATER AND GAS COMPANY. Tenders by Oct. 28.

Coke.

RAMSGATE GAS DEPARTMENT. Tenders by Oct. 12.

Fire-Clay Goods.

CHELTENHAM GAS COMPANY. Tenders by Oct. 20.
LEICESTER GAS DEPARTMENT. Tenders by Oct. 10.

Gasholder.

BARMOUTH GAS COMPANY. Tenders by Oct. 21.

Oxide of Iron.

SALFORD GAS DEPARTMENT. Tenders by Oct. 15.

Pipes, &c.

THAMES VALLEY AND GORING WATER AND GAS COMPANY. Tenders by Oct. 28.

Reservoir (Covered).

THAMES VALLEY AND GORING WATER AND GAS COMPANY. Tenders by Oct. 28.

Retorts.

LEICESTER GAS DEPARTMENT. Tenders by Oct. 10.

Tar and Ammoniacal Liquor.

NORTHWICH GAS COMPANY. Tenders by Oct 9.
SCARBOROUGH GAS COMPANY. Tenders by Oct. 17.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by Oct. 12.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.
JOHN WM. O'NEILL, Managing Director,
PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd.
(Eerste Hollandsche Yzererts Maaty),
ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

COAL GAS TAR wanted.
Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL,
5, CROOKED LANE, LONDON, E.C.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

PENNY-IN-THE-SLOT WORK.
H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1698 HOP. Telegrams: "LUMINOSITY."

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

WANTED, by a Middle-Aged Man, the MANAGEMENT of a Gas Company's Show-Room, and to Superintend Fitters.
Address R. B., 95, PECKHAM RYE, S.E.

ADVERTISER seeks an Appointment at a Gas-Works in Liverpool or Neighbourhood. Present situation, Secretary and Manager of a small Works—8 millions.
Address No. 4096, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED by a Young Man, a Situation as WORKING MANAGER in a Small Works, or as an ASSISTANT. Has had Ten Years' Experience in the routine of Gas-Works. Can lay Mains, Fix Meters, and do all Repairs. Age 24. Abstainer. Good References.
Address GEORGE POOLE, Gas-Works, Madeley, SALOP.

WANTED, a Smart Young Man as GAS-FITTER, MAIN and SERVICE LAYER.
Apply, stating Age, Wages required, &c., to the SECRETARY, Gas-Works, BRECON.

GAS ENGINEERING.

CORRESPONDENCE Tuition in Chemistry, Gas Manufacture, Mechanics, Steam, Electricity, &c., by entirely new method.
Apply, by letter, to No. 4103, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, Two good GAS-FITTERS, experienced in fixing Gas Fires, Cookers, Incandescent Burners, &c. Wages, 30s. per week of 53½ hours.
Applications, with *copies* of Testimonials, to be addressed to ALEX. A. JOHNSTON, Manager, Gas-Works, ILFORD.

WANTED, for medium-sized Gas-Works near Birmingham, a Handy Man to repair Tools and Machinery. Wages 7d. per hour. Preference given to a Practical Mechanic who has held similar appointment.
Apply, enclosing *copies* of Testimonials, to No. 4101, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, a steady, active Man, as METER INSPECTOR and COLLECTOR. Must be of good address, write a good hand, be accurate at figures, well up in reading meters, and have held similar appointment before. Salary offered, 27s. per week.
Applications, stating Age and enclosing Testimonials, to be sent to the ENGINEER, Gas-Works, BEXHILL.

CAMBRIDGE UNIVERSITY AND TOWN WATER-WORKS COMPANY.

WANTED, a Draughtsman and Clerk.
Apply, stating Salary required, Age, previous Experience, and enclosing Two Original Testimonials as to Ability and Character, on or before the 13th of October next.
WM. W. GRAY,
Engineer and Manager.
4, Benet Street, Cambridge,
Sept. 25, 1903.

HOLYHEAD AND NORTH WALES GAS AND WATER CORPORATION, LIMITED.

WANTED, an experienced General FOREMAN for the Holyhead Gas-Works who has had experience in Gaseous Firing, and can also do the necessary Fitting and Repairs on the Works. Wages 35s. per week.
Applications to be posted not later than Monday, the 12th inst., endorsed "Foreman."
GEORGE ED. SAVILLE,
Engineer.
Conway Road, Penmaenmawr,
Oct. 5, 1903.

CITY OF BIRMINGHAM.
(GAS DEPARTMENT.)

GAS-FITTERS WANTED.

APPLICANTS, under 40 years of age, must be fully qualified, used to fixing Wet Meters, and accustomed to all classes of Compo. and Iron pipe work, Stoves and Chandelier fixing. Sample Meter Joints must be made by Applicants prior to engagement. Permanent employment for suitable men. Wages 8d. per hour, rising to 8½d. at the end of Three Months if work and conduct are satisfactory.
Apply, with *copies* of Two recent Testimonials, to GAS-FITTINGS DEPARTMENT, Council House, BIRMINGHAM.

WANTED, a smart Young Man as INSPECTOR of Meters, Stoves, and Burners.
State Experience and Wages required, also References (no Testimonials), to the MANAGER, Gas-Works, PETERBOROUGH.

A HIGH-CLASS French Company, whose Head Offices are in PARIS and who have been engaged for more than 30 Years in the Manufacture of Patented Apparatus of the greatest importance for all Water-Works, desires to find in England an ENGLISH AGENT (who would be paid by Salary and by a Share in the profits) possessing the necessary technical and commercial qualification to introduce and sell their Appliances to Water-Works in the United Kingdom.
Applications, by letter, accompanied by Testimonials and Applicant's Photograph, with the fullest Particulars as to his past Experience and learning (degrees obtained), and previous Occupation—should be addressed to No. 4094, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TAR Contracts Wanted on the Sliding-Sca'e or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

GAS-WORKS WANTED.

WANTED to purchase, small Gas- Works in a growing District.
Full Particulars to A. G. BATES, Gas Engineer, Gordon Villas, Wokingham, BERKS.

WANTED, immediately, about One or Two Dozen Second-Hand STREET LANTERNS. Must be in good condition.
Address, with Particulars and Price, No. 4104, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE — 20-inch Valves, Tees, BENDS, CROSSES, &c. Second-Hand; Cheap. In Good Condition. Makers, Newton Chambers.
Apply to DUXBURY & CO., MANCHESTER.

TO BE SOLD Cheap:—
Two (18 inch) SQUARE STATION METERS, new drums.
TOWER SCRUBBERS from 3 ft. 6 in. up to 12 feet diameter, in pairs or singly.
Patent WASHERS, 8-inch, 10-inch, and 12-inch, by "Holmes," "Kirkham," "Walker," and "Livesey."
EXHAUSTERS, patent type, from 2000 to 100,000 cubic feet per hour.
CONDENSERS, RETORT IRONWORK, GASHOLDERS, STEEL TANKS.
Every description of New and Second-Hand Gas Plant made and supplied.
Inquiries solicited by J. FIRTH BLAKELEY and Co., Thornhill, DEWSBURY.

TO BE SOLD - Gas Valves (Six Screw) by Walker, 16 in. diameter; also Six RACK and PINION, by Donkin, same size. Equal to new.
GASHOLDER, 22 feet by 10 feet, with Steel Tank. Self contained.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS, WATER, AND STEAM TUBES AND FITTINGS.

A QUANTITY of all Sizes to dispose of cheap. Standard Whitworth sizes. High Grade. Made by a First-Class Firm. State requirements; price will be sent. Approval anywhere, carriage paid.
BERNARD CARLYLE, Smethwick, STAFFS.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SCARBOROUGH GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the Scarborough Gas Company invite TENDERS for the surplus TAR to be produced at their Works for One or more Years from the 1st day of January next.
Particulars may be obtained on application to the undersigned.
Sealed Tenders must be delivered not later than noon on Saturday, the 17th day of October next, endorsed "Tender for Tar," and addressed to the Chairman, Gas Offices, 32, Westborough, Scarborough.
By order of the Board,
ALEXANDER ALLAN,
Engineer and Secretary.
Gas Offices, 32, Westborough,
Scarborough, Sept. 21, 1903.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.
Specifications, Quantities, and Form of Tender can be obtained from the Engineer.
Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, the 10th of October, 1903.
The Committee do not bind themselves to accept the lowest or any Tender.
ALFRED COLSON, M.Inst.C.E., M.Inst.E.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Sept. 29, 1903.

MODERN GAS PLANT.

FOR SALE BY TENDER.

COMPLETE Gas-Works Plant to make about 30 Millions annually.
HYDRAULIC MAINS and FITTINGS by Messrs. W. C. Holmes and Co.
Four PURIFIERS, 13 ft. 4 in. by 9 ft., and Centre-Valve for same.
One Laycock and Clapham's Patent "Eclipse" WASHER-SCRUBBER.
One Clapham's Patent "Eclipse" Slow-speed CONDENSER.
One Gwynne and Beale's Patent GAS EXHAUSTER, together with Horizontal Engine on same bed-plate, and fitted with Inlet, Outlet, and Bye-pass Valves.
One New Three-Lift GASHOLDER, 60 ft. 6 in. by 18 ft. deep each lift, on Gadd and Mason's patent principle, without Guide-Framing.
One Single-Lift GASHOLDER, 60 feet by 18 feet deep.
Also VALVES, PIPES, and CONNECTIONS.
The whole of the Plant is in first-rate condition, and can be seen by Appointment.
Sir TITUS SALT, Bart., SONS, and Co., Limited, Saltaire, YORKSHIRE.

RAMSGATE CORPORATION.
(GAS DEPARTMENT.)

THE Committee invite Tenders for the purchase of their surplus COKE from the 1st of October, 1903, to the 30th of September, 1904. Probable quantity, 2000 to 3000 Tons, delivered free on rail or free into barge Ramsgate; purchaser paying dues.
Tenders to be sent in not later than Ten a.m. on Monday, Oct. 12, 1903, addressed to the Chairman of the Gas Committee, Boundary Road, Ramsgate, and endorsed "Tender for Coke."
The Committee do not bind themselves to accept the highest or any Tender.
T. N. RITSON,
Engineer.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

THE Directors of the above Company invite TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR produced at their Works from Jan. 1, 1904, to June 30, 1905.
Further Particulars may be had on application to the undersigned.
Sealed Tenders, endorsed "Tar," or "Tar and Liquor," and addressed to the Chairman, must be sent in not later than Monday, Oct. 12, 1903.
WM. SEVERS,
Engineer and Manager.
Gas-Works, Wilmslow,
Sept. 28, 1903.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the purchase of about 1400 Tons of SPENT OXIDE.
Further Particulars and Form of Tender may be obtained from Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Spent Oxide," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be sent to me not later than Three p.m. on Thursday, the 15th of October, 1903.
L. C. EVANS,
Town Clerk.
Town Hall, Salford,
Oct. 1, 1903.

THAMES VALLEY AND GORING WATER AND GAS COMPANY, LIMITED.

WATER-SUPPLY EXTENSIONS.
CONTRACT No. 4.
COVERED HIGH-SERVICE RESERVOIR AND 12 MILES OF DISTRIBUTING-MAINS.

THE Directors are prepared to receive TENDERS for the construction of a COVERED HIGH-SERVICE RESERVOIR, Superintendent's HOUSE and OFFICES, FITTERS' SHOP, BOUNDARY WALL and FENCE, Road Making, and the Supplying, Hauling, and Laying of about 12 miles of Distributing MAINS, in accordance with Plans and Specifications prepared by their Engineer, Mr. George H. Robus, Mansion House Chambers, London, E.C., where Plans may be seen in Room 339, between the hours of 11 and One o'clock any day from Oct. 7 to Oct. 21, and copies of Specification obtained upon deposit of £3 3s., which will be returned upon receipt of *bonâ-fide* Tender.
The Engineer will be in attendance at the Reservoir Site, Woodcote, near Reading, on Wednesday, Oct. 14, at Twelve o'clock, to meet intending contractors.
Sealed Tenders to the Secretary by Ten a.m., Oct. 28.
The Directors reserve the right to accept any Tender.
J. HUNT, Secretary.
Oct. 1, 1903.

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the Directors have this day declared an Interim Dividend at the rate of 6 per cent. per annum for the Six Months ending June 30, 1903 (being 6s. per Share), free of Income-Tax, payable on and after the 20th inst.
And NOTICE is HEREBY FURTHER GIVEN to holders of Share Warrants to Bearer of this Company that Coupon No. 27 will be paid by the Company's Bankers, the Union of London and Smith's Bank, Prescott's Branch, 50, Cornhill, E.C., on and after the 20th inst., at the rate of 6s. per Coupon. Coupons must be left with the Bankers Three clear Days for examination.
TRANSFER BOOKS WILL BE CLOSED from the 7th to the 20th inst., both days inclusive.
By order,
J. M. MACMORRAN,
Secretary.
1, East India Avenue,
Leadenhall Street, E.C.,
Oct. 1, 1903.

BARMOUTH GAS COMPANY, LIMITED.

TENDERS are invited for the Construction and Erection of a TELESCOPIC (Gadd and Mason) GASHOLDER (outer lift 38 feet diameter, inner lift 36 feet diameter, 14 ft. 6 in. deep) for the above Company.

Plans and Specification may be seen at the Gas-Works, Barmouth, or at the Office of the Company's Engineer, Mr. W. Belton, Gas-Works, Shrewsbury, from whom any further Information may be obtained, and to whom Tenders must be delivered not later than Oct. 21, 1903.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the surplus TAR produced at these Works during the Year ending Sept. 30, 1904.

Coal carbonized about 6300 Tons.

Any further Particulars requested can be had on application to the undersigned.

Tenders, endorsed "Tar," and addressed to the Chairman, must be delivered here not later than Ten a.m. on Friday, Oct. 9, 1903.

S. S. Mellor,
Manager and Secretary.

Gas-Works, Northwich,
Sept. 22, 1903.

CHELTENHAM GASLIGHT AND COKE COMPANY.

FIRE-BRICKS, &c.

TENDERS are invited for the supply of FIRE-BRICKS, ARCH BLOCKS, and FIRE-CLAY.

Specification of Quantities may be obtained from the undersigned, to whom Tenders must be delivered on or before the 20th inst.

The lowest or any Tender will not necessarily be accepted.

R. O. Paterson,
Engineer.

Gas-Works, Cheltenham,
Oct. 3, 1903.

BRISTOL WATER-WORKS COMPANY.

SALE OF ORDINARY STOCK.

MESSRS. ALEXANDER, DANIEL, AND CO. will SELL BY AUCTION, at the Bank Auction Mart, Corn Street, Bristol, on Thursday next, the 8th of October, 1903, at Three o'clock in the Afternoon,

£15,000

BRISTOL WATER-WORKS 7 PER CENT. MAXIMUM CONSOLIDATED ORDINARY STOCK, in Lots of £100,

At the reserved price of £147 for every £100 Stock.

The above £15,000 Stock is part of the 7 per cent. Maximum Consolidated Ordinary Stock, amounting to £690,000, created under the powers of the Bristol Water-Works Acts, 1888, 1889, and 1895.

The Dividend is subject to proportionate diminution whenever the Maximum Dividend to which each class of Ordinary Shares or Ordinary Stock of the Company is entitled shall not be paid in full, but such diminution may be made up in subsequent years.

For further Particulars and Conditions of Sale, apply to the Auctioneers, Bank Chambers, Corn Street, Bristol; to Fussell and Co., Solicitors, 36, Corn Street, Bristol; or to

Alfred J. Alexander,
Secretary and General Manager.

Bristol Water-Works Office,
Small Street, Bristol.

TO CAPITALISTS AND INVESTORS.

NEW ISSUE OF STOCK
IN THE MAIDSTONE GAS COMPANY.

MESSRS. W. DAY & SONS are favoured with instructions from the Directors to SELL BY PUBLIC AUCTION, at the Star Hotel, Maidstone, on Thursday, Oct. 15, 1903, at Three o'clock, in Lots to suit large and small investors,

£5000
CAPITAL STOCK
AND
£2500
3 PER CENT. DEBENTURE STOCK
IN THE
MAIDSTONE GAS COMPANY.

Issued under the Maidstone Gas Act, 1903.

Particulars and Conditions of Sale may be obtained of Messrs. Hoare, Howlett, and Tatham, Solicitors, 9, King Street, Maidstone; or at the Auctioneer's Offices, 23, High Street, Maidstone.

THE PERFECT MANTLE COY.,

1c, Aldgate Avenue, London, E.C.

Manufacturers of the well-known

SUPERIOR "PERMCO"

MANTLE, IN COTTON AND RAMIE.

Under Welsbach Licence. Can be used legally with any Burner.

Trade Price 26s. 6d. per Gross.

Reduction for Quantities.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. Alfred Richards' Offices, 18, Finsbury Circus, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £13,200 NEW ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

By order of the Directors of the
ROMFORD GAS AND COKE COMPANY LIMITED.

NEW ISSUE OF 650 £5 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 300 £10 "C" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 20, at Two o'clock precisely, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

BARKING GAS COMPANY.

167 £10 ORDINARY 7 PER CENT. SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

GREAT YARMOUTH WATER-WORKS COMPANY.

SALE BY AUCTION OF 500 £10 ORDINARY SHARES,

Ranking for 7 per cent. Dividend, 4 per cent. having been paid on similar Shares in the Company for seven years past. The Company was incorporated fifty years ago, for supplying the important seaport town of Great Yarmouth and its surrounding districts; and to keep pace with the increasing demand for water, this further capital for the construction of new works is required.

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MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots, by Order of the Directors.

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By order of the Directors of the
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NEW ISSUE OF £3500 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 27, at Two o'clock, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

By order of the Directors of the
GRAYS GAS COMPANY, LIMITED.

NEW ISSUE OF 200 £10 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the MART, E.C., on Tuesday, Oct. 27, at Two o'clock, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

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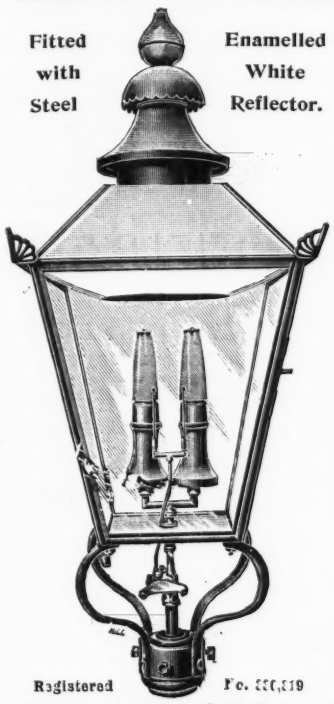

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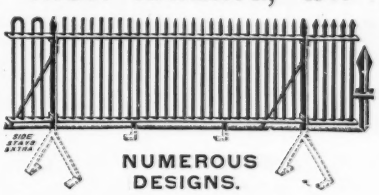

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NOTICE TO THE TRADE.

In consequence of the **SENSATIONAL** advertisements issued by the New Inverted Incandescent Gas-Light Company, Limited, we beg to announce that, to-day, application was made to

The Hon. Mr. JUSTICE BUCKNILL,

for an injunction to restrain the Sale of the Burner of the

"STAR" INVERTED INCANDESCENT BURNER

Company, Limited. Our contention was that the Burner is

NO INFRINGEMENT,

and the Company did not press for an injunction. Therefore

NO INJUNCTION

has been granted, and we are quite free to Sell in Competition with our **JEALOUS COMPETITORS.** The Trade will do well to notice that our Burner is

30 per cent. CHEAPER & 50 per cent. BETTER,

and that we **INDEMNIFY OUR CUSTOMERS** against loss, or molestation, upon report being made to us, or to our Solicitor, **Mr. JONATHAN E. HARRIS, 95, Leadenhall Street, London, E.C.**

THE "STAR" INVERTED INCANDESCENT BURNER CO., LTD.,
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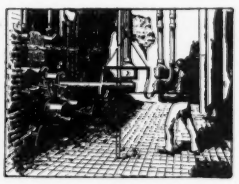
Nearly 40 of these Machines have been



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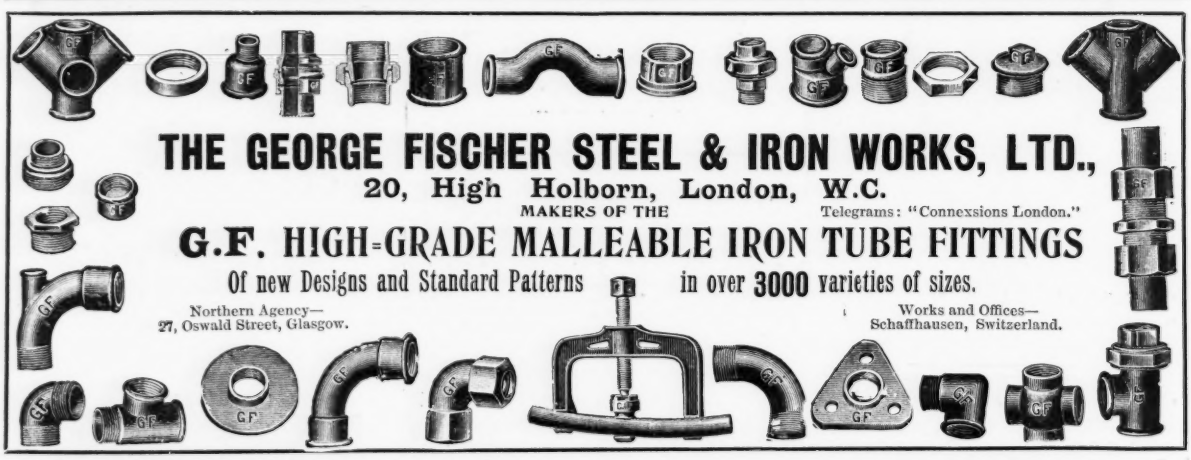

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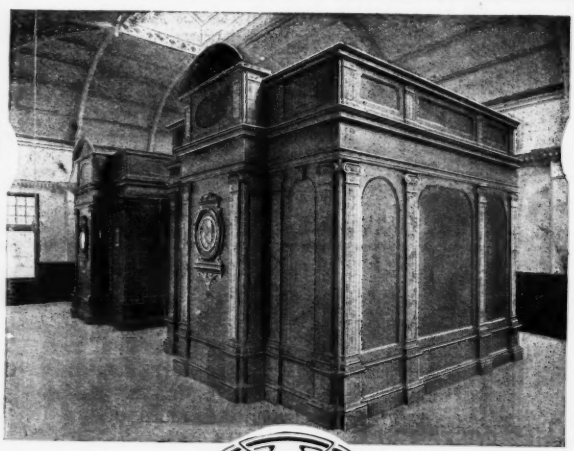

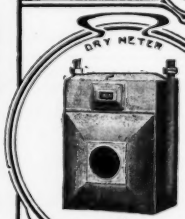

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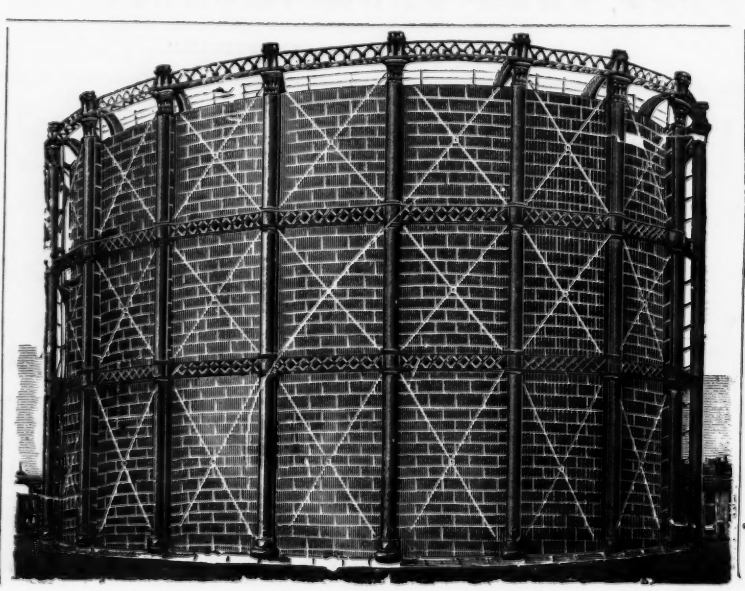

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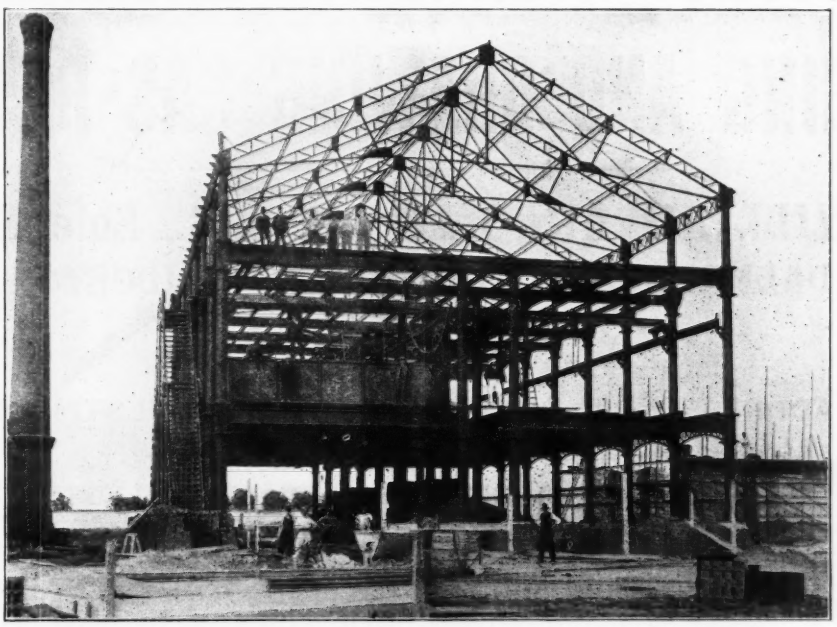

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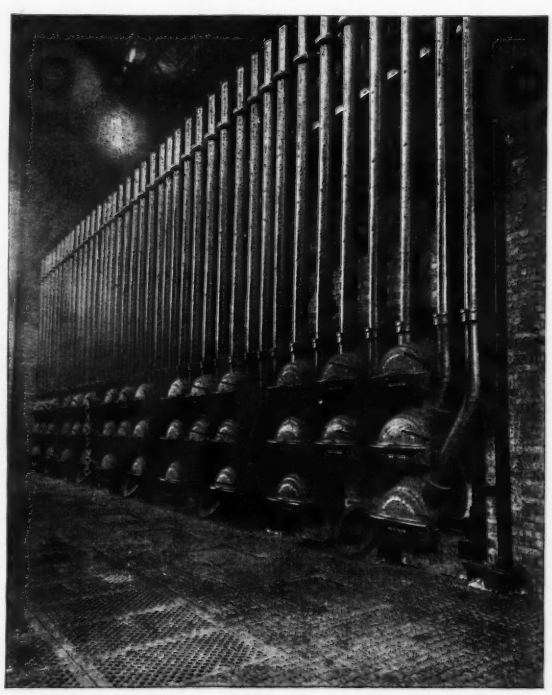

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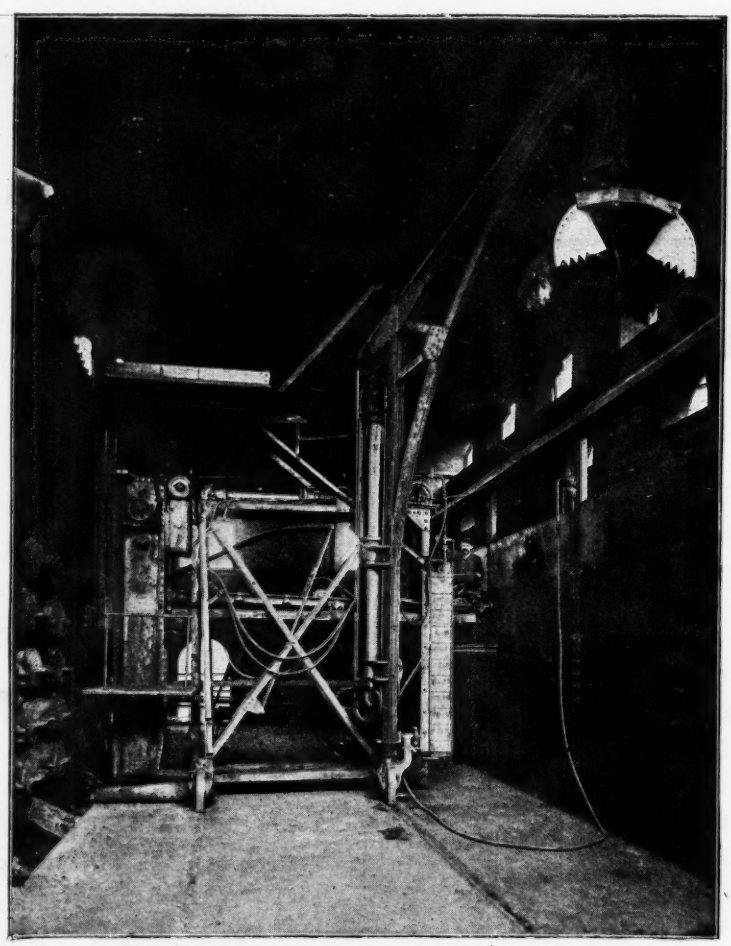

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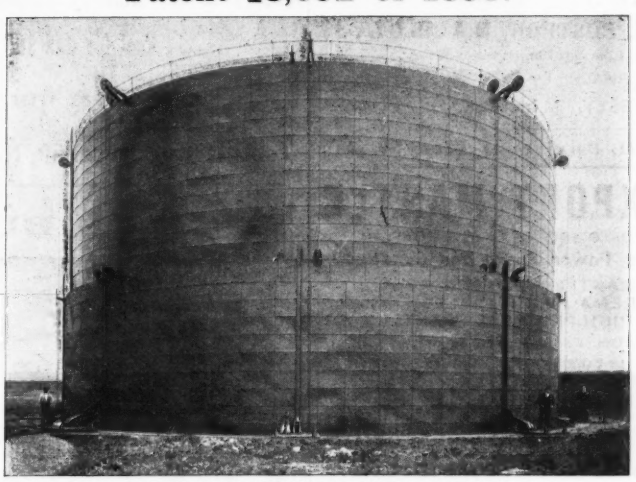

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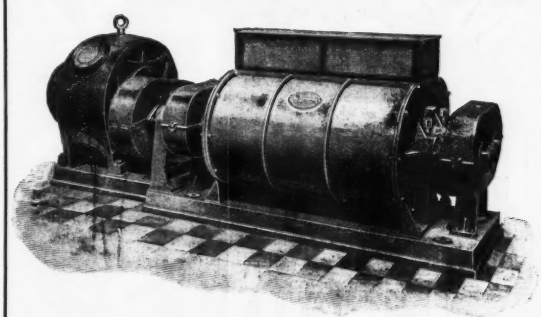

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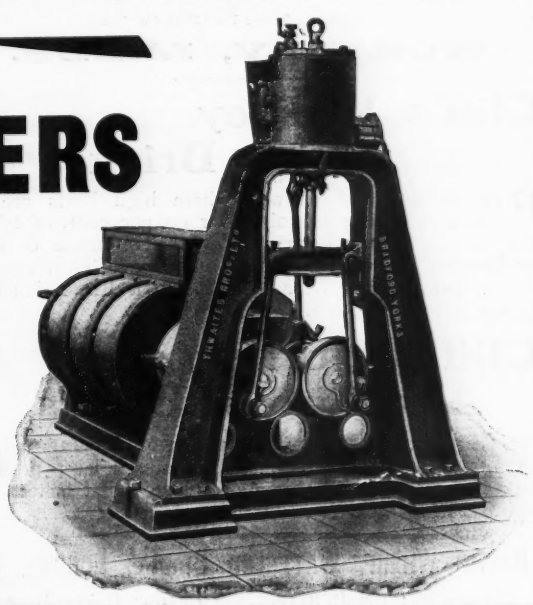

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With a Preface by
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FOR Arches and Crowns where high heats are required. They contain over 90 per cent. of Silica, and are nearly stationary under the influence of heat, swelling a little rather than contracting. They are not like a Gannister or Dinas Brick, but a Fire-Brick of a highly Silicious nature.

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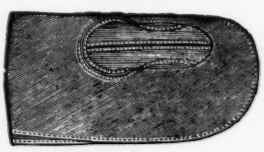

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Made from best Tanned Leather.

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Miners Woollen Jackets No. 1, 12/- each; No. 2, 9/6.

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MECHANICAL COAL HANDLING PLANTS

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MADE AND ERECTED BY

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MAKERS OF THE LARGEST GASHOLDER IN THE WORLD ALSO
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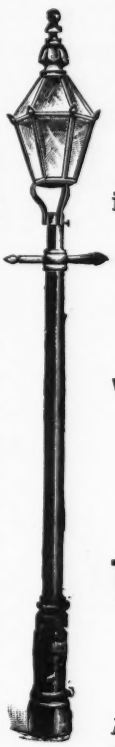

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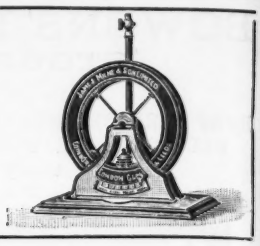

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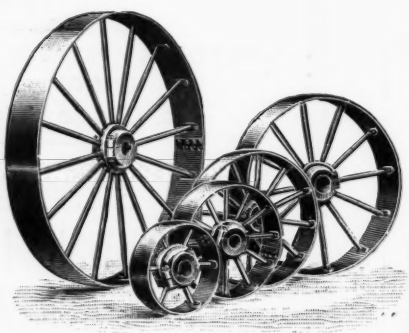

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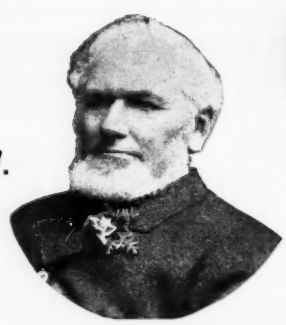

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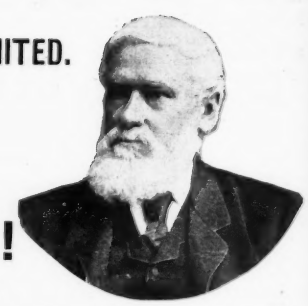

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WASHER SCRUBBER (Laycock and Clapham's Patent).

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RAPID AUTOMATIC FASTENINGS AND **RUBBER JOINT** (Clapham's Patent) FOR

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THE **"NEW CENTURY COVER"** FOR **PURIFIERS.**

SELF-SEALING MOUTHPIECES for Inclined and Horizontal Retorts. **MAINS, VALVES, &c.**

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NEW SIZES.

RICHMOND'S

"Cambridge" Condensing Stove.

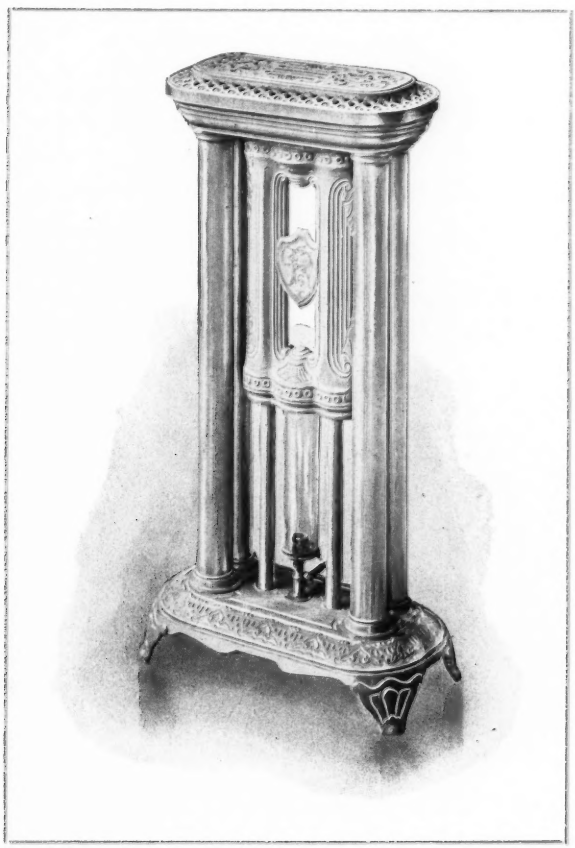
SUITABLE FOR BOARD ROOMS, LARGE OFFICES, SHOPS, HALLS, ETC.

No.	High.	Wide.	Deep Back to Front.	Best Black Enamel.
2565	33 in.	24 in.	9 in.	**90/-**

WHITE FLAME. NO FLUE REQUIRED.

RICHMOND'S

"Surrey" Condensing Stove.



SUITABLE FOR OFFICES, SHOPS, STUDIOS, VESTIBULES, HALLS, ETC.

No.	Wide.	High.	Deep. Back to Front.	Best Black Enamel. Copper Tubes.	"Porcellanite" Enamel.
2561	17 in.	33 in	9½ in.	**63/-**	**87/6**

WHITE FLAME. NO FLUE REQUIRED.

RICHMOND'S
NEW PATTERN
"STRATFORD."

BOILING BURNER ON TOP.

SUITABLE FOR BEDROOMS, LIBRARIES, NURSERIES, Etc.

No.	Height.	Width.	Fire.	PRICE.	"Porcellanite" Enamel.
1459	16½ in.	15½ in.	6 in.	**20/-**	**29/6**
1461	18½ in	17 in.	8 in.	**22/6**	**34/6**
1463	23 in.	19 in.	10 in.	**27/6**	**40/6**

Hot-air Chamber, 2/- extra. Elbow for Flue Outlet, 1/- to 1/6 extra, net.

Nickel Plated Trivet, 2/- extra. Trivets sent with all Fires unless ordered to contrary.

Swing Fender.
Burner Removable.
Patent Water Gas Attachment.
Special Radiating Brick.

RICHMOND'S

NEW DESIGN

"WAVERLEY."

BOILING BURNER ON TOP.

SUITABLE FOR BEDROOMS, LIBRARIES, NURSERIES, ETC.

No.	High.	Wide.	Width of Fire.	Best Black Enamel.	"Porcellanite Enamel.
2484	25 in.	21 in.	10 in.	**32/6**	**52/6**
2486	26 in.	23½ in.	13 in.	**40/-**	**63/-**

Hot-air Chamber, 2/- extra. Elbow for Flue Outlet, 1/6 to 2/- extra, net

Nickel Plated Trivet, 2/- extra. Trivets sent with all Fires unless ordered to contrary

Swing Fender.
Burner Removable.
Patent Water Gas Attachment.
Special Radiating Brick.

Richmond's "Porcella

"SHAMROCK."

SUITABLE FOR TILED RECESSES IN DRAWING AND DINING ROOMS, ETC.

No.	Height.	Width.	Width of Fire	Best Black Enamel.	"Porcellanite" Enamel (as shown).
1409	25 in.	16 in.	10 in.	52/6	72/6
1411	29 in.	18 in.	13 in.	62/6	84/-

SUPPLIED
FOLLOWING CO
ANY
PATTERN FIR
RICH GREEN.
NEUTRAL GREE
RICH BROWN.
NEUTRAL BROW
MADDER BROW
RICH BLUE.
PALE BLUE AND
WHITE.

cellanite" Enamelling.

PPLIED IN
VING COLOURS
ANY
TERN FIRE:—
GREEN.
RAL GREEN.
BROWN.
RAL BROWN.
ER BROWN.
BLUE.
BLUE AND
E.

"RUTLAND."

SUITABLE FOR SHOPS, OFFICES, VESTIBULES, HALLS, ETC.

No.	Height.	Width.	Back to Front.	Best Black Enamel.	"Porcellanite Enamel (as shown).
3045	22 in.	19 in.	12 in.	**42/6**	**57/6**
3047	25 in.	22 in	16½ in.	**52/6**	**70/-**

.. THE ..
"RICHMOND."

SWING FENDER and
REMOVABLE BURNER.

SUITABLE FOR BEDROOMS, SITTING ROOMS, NURSERIES, ETC.

No.	High.	Wide.	Width of Fire.	Best Black Enamel.	"Porcellanite" Enamel.
1466	23 in.	19 in.	10 in.	**25/-**	**33/6**
1466H	26 in.	20 in.	10 in.	**31/-**	**42/6**
1468	29 in.	22 in.	13 in.	**35/-**	**52/6**

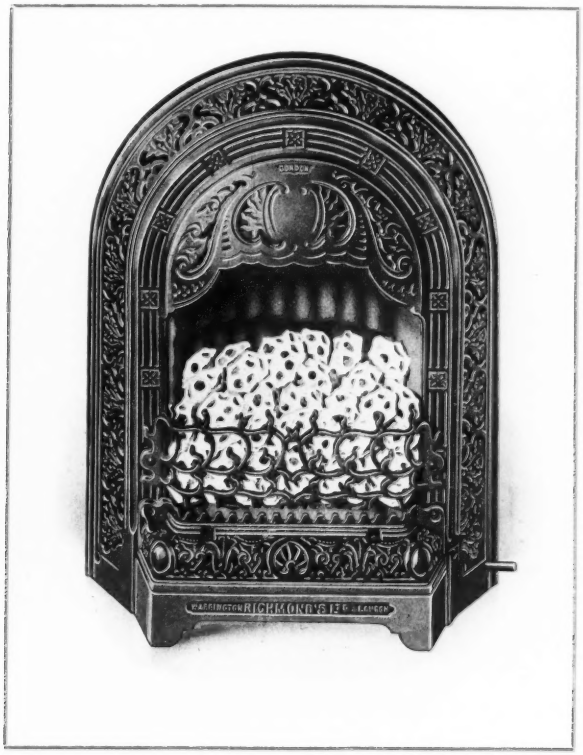
Hot-air Chamber, 2/- extra. Elbow for Flue Outlet, 1/6 to 2/- extra, net.

Nickel Plated Trivet 2/- extra. Trivets sent with all Fires unless ordered to contrary.

Swing Fender.
Burner Removable.
Patent Water Gas Attachment.
Special Radiating Brick.

RICHMOND'S

"GORDON."



SUITABLE FOR BEDROOMS, SITTING ROOMS, NURSERIES, ETC.

No.	High.	Wide.	Width of Fire.	Best Black Enamel.	"Porcellanite" Enamel.
1473	21½ in.	17 in.	8 in.	**21/-**	**31/-**
1474	23 in.	19 in.	10 in.	**26/-**	**34/6**
1474 H	26 in.	20 in.	10 in.	**31/6**	**43/6**
1476	29 in.	22 in.	13 in.	**36/-**	**53/6**

Hot-air Chamber, 2/- extra. Elbow for Flue Outlet, 1/- to 2/- extra, net.

Nickel Plated Trivet, 2/- extra. Trivets sent with all Fires unless ordered to contrary.

Swing Fender.
Burner Removable.
Patent Water Gas Attachment.
Special Radiating Brick.

RICHMOND'S

"Reform" Register Gas Fire.

FOR FITTING INTO THE FIREPLACE OF AN ORDINARY COAL GRATE BY SIMPLY REMOVING THE LOOSE FIRE BARS.

No.	High.	Wide.	Width of Fire.	To Fit Grate about	Best Black Enamel.	"Porcellanite" Enamel.
1421	16 in.	13 in.	8 in.	14 in.	**18/6**	**30/-**
1423	17 in.	15 in.	10 in.	16 in.	**22/6**	**35/-**
1425	17 in.	17 in.	13 in.	18 in.	**27/6**	**40/-**

These Prices include Nickel-plated Trivet.

RICHMOND'S

"Midland" Gas Fire.

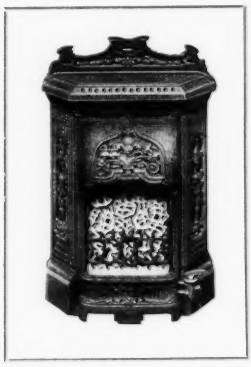
SUITABLE FOR BATHROOMS, BEDROOMS, NURSERIES, ETC.

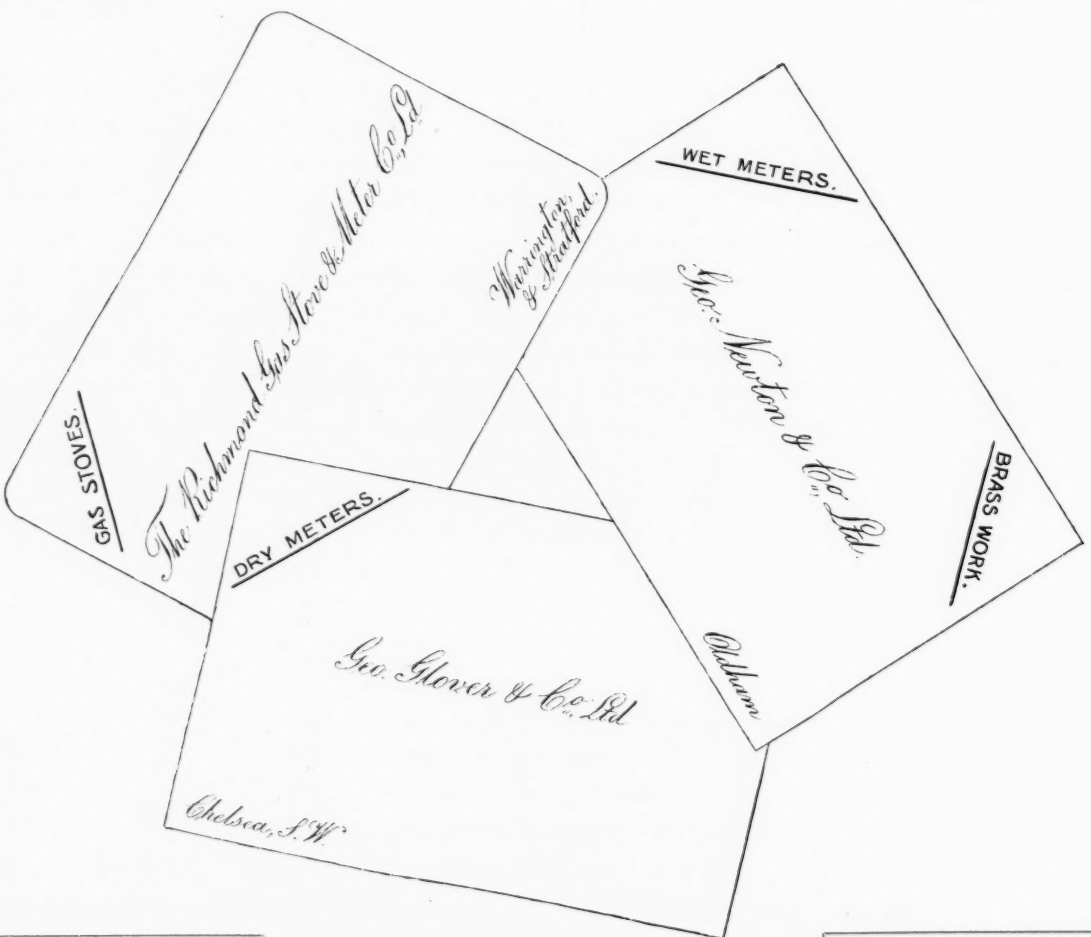
No.	High.	Wide.	Deep Back to Front.	Best Black Enamel.	"Porcellanite" Enamel.
584	18½ in.	13 in.	10 in.	**17/6**	**32/6**
586	18½ in.	15 in.	10 in.	**21/-**	**36/-**

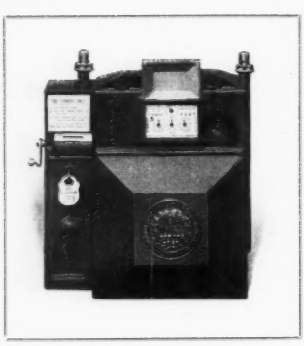
If with Boiling Burner on top, 5/- extra.

WHITE FLAME. NO FLUE REQUIRED.

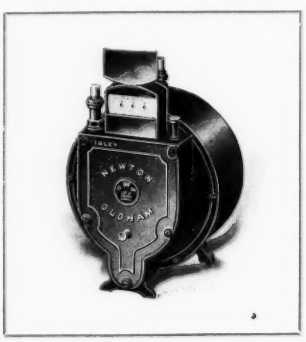
RICHMOND'S







MANUFACTURES.



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